

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND

REG'D. TRADE MARK, GREAT BRITAIN, NO. 410428

Special! **Giant AUTO
Supplement**

48 Pages All About Cars . . . 8 in
Full Color . . . including . . . the '53
Models . . . How to Break in a
New Car . . . Clymer on Motor-
cycles . . . many other features



Hudson's new light car—
The JET (see page 112)

FOR 1953...

A New KING-SIZE Value

IN OUTBOARD MOTORS



Johnson Sea-Horse 10

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F. O. B. FACTORY

Johnson presents a new king-size value to outboard motoring — the brilliant Sea-Horse 10, WITH Gear Shift, WITH Mile-Master Fuel Tank, WITH Synchro Twist-Grip Speed Control, AND specially engineered for Johnson's new Ship-Master Remote Control. Here is power to breathe new life into your boat—the last word in fine outboard engines. All at a price that only Johnson's outstanding production makes possible...

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JOHNSON MOTORS, 400 Pershing Road, Waukegan, Ill.
In Canada: Mfd. by Johnson Motors, Peterborough

THE ONLY MANUFACTURER WHO HAS
BUILT A MILLION OUTBOARD MOTORS



BETTER PRODUCTION FACILITIES
... BETTER VALUE

Don't get caught with your **Battery down**



WHEN your battery "goes"—you don't! Why take chances? Stop in at your Goodyear dealer's today—have your battery checked *free* with the portable, accurate, Goodyear All-Purpose Tester. It's the **ONLY** way to spot battery troubles before they start. While there—ask about the Goodyear Dry Proof Double Eagle Batteries, too.

Goodyear, Battery Dept., Akron 16, Ohio.

GOOD YEAR

DRY PROOF • DOUBLE EAGLE BATTERIES



Double Eagle—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

We think you'll like "THE GREATEST STORY EVER TOLD"—every Sunday—ABC Radio Network
THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network

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You can operate your own business in spare time and have a permanent, profitable full time business when your present job ends.

If you are dependable, honest and willing to work to own a large-profit, lifetime business and become financially independent, we invite you to mail coupon for full details.

We are now enlarging this 23-year-old, world-wide chain of individually-owned service businesses. We'll

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Patented
machine becomes
carrying case.



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of PROVEN SUCCESS

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Fabrics last longer because this modern safe cleaning process avoids strong soaps and harmful solvents. No machine scrubbing! This eliminates unnecessary wear on pile and the breaking of fibers.

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No experience necessary! Some dealers establish shops or an office... others operate from their own homes. At the start you may want to render service yourself. Service may be rendered in homes, offices, hotels, theaters or institutions. Auto dealers buy your **DURACLEAN** Service to revive upholstery in used cars. Almost every building in your territory houses a potential customer needing one or both services.

Repeat and Voluntary Orders

Demonstrations win new customers. Men with **DURACLEAN** Dealerships find **REPEAT** and **VOLUNTARY** orders become a major source of income. Customers are not merely satisfied—many are enthused with results and tell their friends and neighbors. Furniture and department stores and interior decorators turn over rug and upholstery cleaning and mothproofing to **DURACLEAN** Dealers. We show you 27 ways to get new customers.

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You enjoy big profits on BOTH materials and labor—after paying service men and salesmen. This is a year-round large-profit business. You have the cooperation of a 23 YEAR OLD organization interested in your success. The rapidly growing need for these services makes TODAY the ideal time to become the owner of a **DURACLEAN** Service business while territory is still available.

What Dealers Say

- W. Looklebill: We've had 20 years of pleasant dealings. I'm 65 but am setting my sights for 20 more years.
Gerald Merriman: This made me \$700 cleaning with only 13 working days.
P. D. Freidinger: 70% of our business is repeat.
A. Ullman: Every demonstration has been a sale.
L. Ellsworth: Your advertising certainly has paid dividends.
M. Lassanske: My original investment was returned in about two months. I am not sorry in any way that I started my business 'on a shoe string.'
R. Kimbrough: Finished First White House of Confederacy and am to Duraclean the Governor's Mansion.
Margaret Turner: Took in \$106 that week and worked about 15 or 18 hours.
L. Johnson: Each customer leads to 3 or 4 more.

EASY TERMS!

A moderate payment establishes your own business—pay balance from sales. We furnish electric machines, folders, store cards, introduction slips, sales book, demonstrators and enough material to return your TOTAL investment. Your business can be operating in a few days. Mail coupon today! No obligation.

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Deerfield, Illinois, U. S. A.**

With no obligation to me, send booklet and letter giving full details. Tell me how I may OWN a growing business of my own built upon satisfied customers.

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Address _____

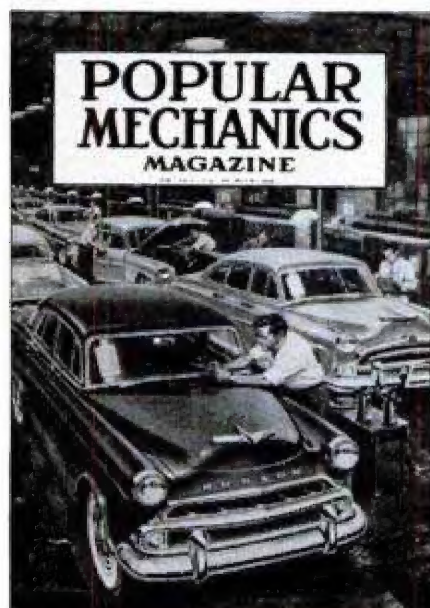
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Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

ROLLING OFF the assembly line is the sporty Hudson Jet, the only new name on the 1953 automobile roster. The cover painting of the Jet bears the deft touch of artist Roswell Brown, who also did the beautiful series of paintings starting on page 97. Brown, shown at work below, prepared himself for this assignment by visiting Flint, Lansing, South Bend and Detroit, where he studied the chattering confusion of the assembly lines, took many photos and made on-the-spot sketches



Published monthly by Popular Mechanics Company, 200 E. Ontario St., Chicago 11, Ill. H. H. Windsor, Jr., president; William Harrison Petridge, vice-president; D. F. Windsor, vice-president and secretary-treasurer; H. H. Windsor III, vice-president; Clover L. Perkins, advertising manager; Alan M. Deyoe, circulation manager. Single copy in the United States and Canada, 35 cents; subscription rates in the United States and possessions, Canada, Philippines and countries of the Pan-American Postal Union, 1 year \$3.50; 2 years, \$6.00; 3 years \$8.00. To all other countries add \$1.00 a year over United States prices for overseas postage. If you plan to move, notify us at least 30 days in advance so you will not miss an issue. Give both your old and new addresses. Entered as Second Class Matter, September 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at Post Office Dept., Canada. Registered as Second Class Matter at the Post Office at Mexico, D. F., Mexico, June 20, 1950. Copyright 1953 by Popular Mechanics Company. Copyright under International Copyright Union. Copyright in France. All rights reserved under Pan-American Copyright Union. Printed in the United States of America.

Volume 99

FEBRUARY 1953

Number 2

Address all communications to:

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IN THIS ISSUE

Look What's Happening to Your Blood - - -	81
Floyd Clymer Reports on Motorcycles - - -	90
Special Auto Supplement—	
Men and Machines That Make Automobiles	97
Parade of the New Cars - - - - -	106
What to See in '53 - - - - -	114
American Engineers Look at Foreign Cars	121
Mexican Road Race - - - - -	124
Antiques on Parade—the Glidden Tour -	130
The Making of a Sail - - - - -	143
Earthquake Fighters Rebuild a Railroad -	149
Diving 45 Fathoms for Pearl - - - - -	154
Titanium—"Tough Guy" of the Lightweights	158
"Whirly Bird" Pilots Go to School - - -	166
He Bosses 11,000 Acres by Radio - - -	172
Bad-Man's Ghost Town - - - - -	180

For the Craftsman

Just Like New With Flexible Paint - - -	185
Here's Glamour for Your Basement—Part II	187
Plaster Casting - - - - -	202
36-in. Model of the SS United States—Part III	214
Break 'Em in Right! - - - - -	222
Know Your Hammer - - - - -	233
Stands for Your Power Tools - - - - -	238
Radio, TV and Electronics - - - - -	247
Clinic for Homemakers - - - - -	260

Other items are listed on pages 12, 14 and 16

Do You Know?



Why *Nash* cars are built like modern trains, buses and airliners . . .

LIKE TODAY'S AIRLINERS, the modern bus, and streamlined train, Nash cars are built with body and frame as one integral unit! Frame, floor, roof, girders and even the steel panels of the body itself are a single welded structure, each part adding strength and rigidity to every other part. Engineers call this "stressed skin" construction. Nash calls it "Airflyte Construction", and has built almost a million cars utilizing this advanced design principle.

Here's why Nash uses Airflyte Construction: engineering tests prove that Airflyte Construction has more than twice the torsional rigidity (or resistance to twisting) of ordinary separate body-and-frame construction—and provides far greater safety to passengers by literally surrounding them with a

protective steel cradle. Airflyte Construction eliminates almost two-thirds of the frame weight—resulting in greater performance and fuel economy. Airflyte Construction absorbs road shocks within the body structure, and eliminates body-bolt rattles—to give new concepts of quietness and comfort.

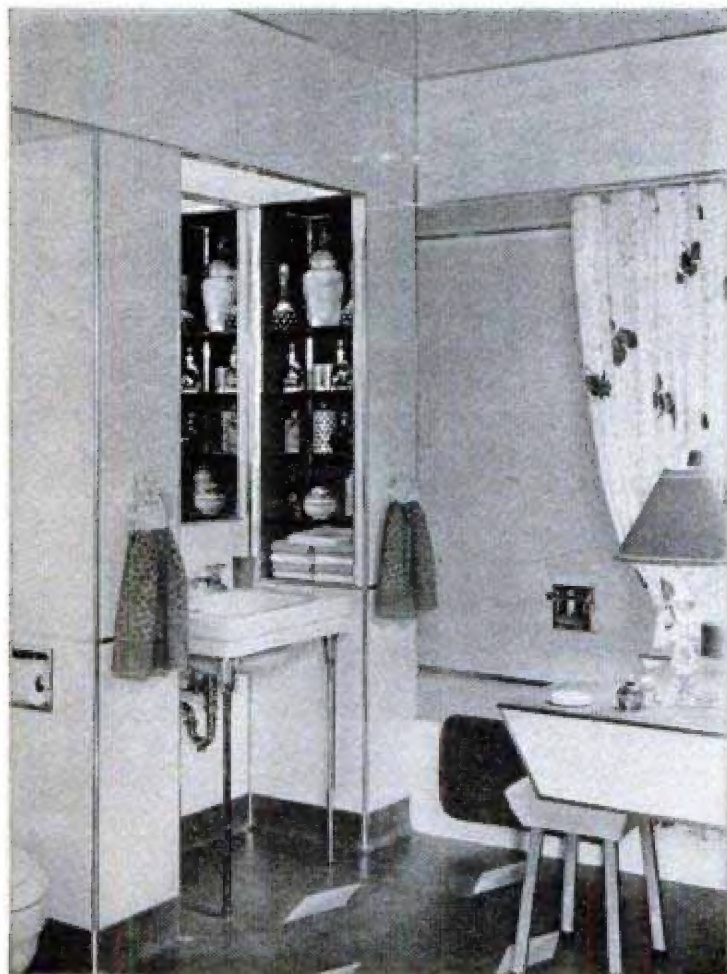
You can't appreciate the difference that Airflyte Construction makes until you drive a Nash. Your nearby Nash dealer invites you to see the beautiful new Nash Airflyte for 1953 and "road-test" this most modern of motorcars yourself.

Nash Motors

Division Nash-Kelvinator Corporation,
Detroit 32, Michigan

*Here's a job
you can do*

REFINISH YOUR BATHROOM with Armstrong's M-67 Monowall



You can remodel your own bathroom, and save money doing it, when you install Armstrong's M-67 Monowall.

Monowall is a tempered hardboard panel finished with a tough plastic called M-67*. This durable surface offers amazing resistance to hard knocks, stains, dirt, and harsh solvents. Its nine decorator colors come in three smart patterns . . . tile, plain, and streamline. Armstrong's M-67 Monowall is available 4' wide and in lengths up to 12'.

If the old walls are in good condition, you simply cement Monowall right over them. The whole job can be done with ordinary hand tools. You can cover the entire room, or only the lower walls. The joints and edges are trimmed with neat metal channels. Your lumber dealer will give you more information on this practical wall covering. For the free booklet, "How to Install Armstrong's M-67 Monowall," write the Armstrong Cork Company, 9002 Lincoln Street, Lancaster, Pennsylvania.



* T.M. applied for



Cut Monowall to size . . . trowel on cement . . . and press into place

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your motor with

PYROIL

● Pyroil is the ideal "pepper-upper" for your car, because it removes sludge and gummy deposits, and keeps your motor clean. In that way, gas and oil can flow through the motor more easily, more efficiently, more economically. Pyroil keeps vital motor parts—piston rings and cylinder walls—protected with a fine coating of lubrication at all times. This prevents rust, due to condensation. It eliminates costly metal-to-metal wear. Pyroil relieves battery drain and assures "easy starts."

To step-up your car performance, pep up your motor with Pyroil. When you add gas or oil, add Pyroil—add miles to your car.

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Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

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Canadian Distributors: Central Purchasing Agencies, Ltd., Toronto, Ontario



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I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name _____

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City or Town _____ State _____



in this corner.....

THE EDITORS



Letter to the Editor:

Nobody would think of hand-cranking a car, if he can have a mechanical starter. But why, oh why, do so few people in the States use a mechanical directional signal? Hundreds of times one experiences that a driver turns to the right or left without giving a hand signal. The reason may be that it is just raining or snowing, or that the mother-in-law in the back seat complains about a draft when the driver opens a window to give hand signals. I was with the Army in Europe and found that mechanical direction signals are obligatory for cars in many countries. I don't believe that everything is better in other countries—on the contrary; but directional signals are such a good idea and may prevent a lot of accidents. No, I am not in the automobile or accessory business. It is just my honest opinion that hand signals are as outdated as hand-cranking a car, and I can't understand why nobody is doing anything about it.

W. J. Steen
Manhattan Beach, Calif.

Wanted: Rugged Gasoline Wagon

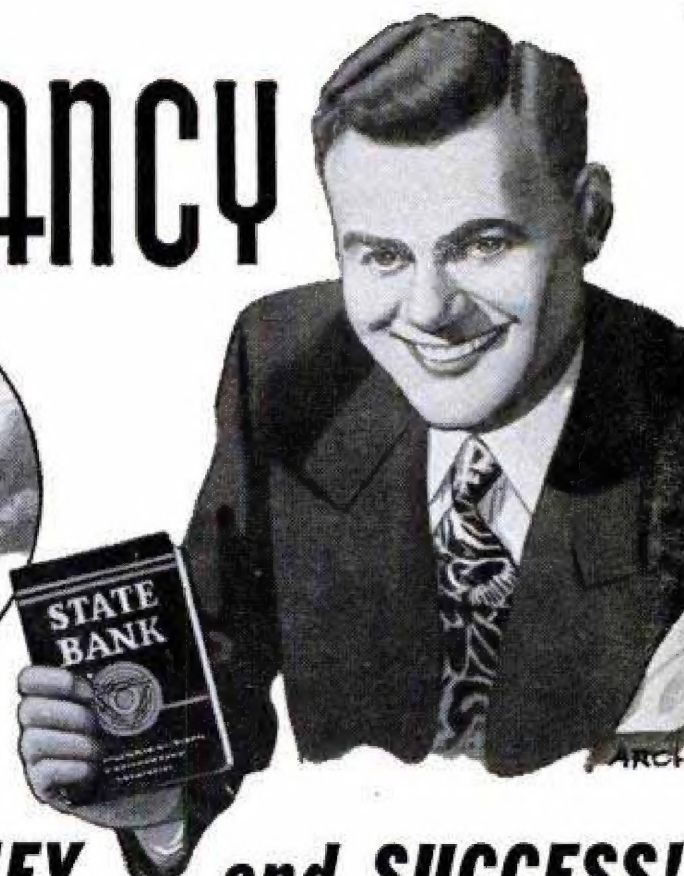
I want an automobile—and I don't mean one of those new-look cucumbers with the wheels cunningly concealed somewhere underneath. Neither do I want a perambulating boudoir nor an itinerant cocktail



lounge. The degeneration of the horseless carriage has been tragic, and it gets worse as each new supercolossal model makes its debut. The modern automobile has become unbelievably sissified at the same time that

(Continued to page 8)

5 reasons why ACCOUNTANCY



offers you MORE MONEY... and SUCCESS!

REASON #1. If you were an expert accountant right now, chances are you would find yourself among the highest-paid of all professional men and women. Even back in "depression years," surveys showed that accountants earned more on the average than men in other major professions.

REASON #2. The demand for accountants is great—everywhere. All businesses must have trained accountants to cope with ever-growing requirements. It's a profession offering wide opportunity—always—to the man who knows.

REASON #3. You can fit into any business, anywhere in the country—because accounting principles are universal. Think what this means in terms of security and independence!

REASON #4. Accountancy is open to all. Any man or woman of good intelligence, who enjoys figure work and is willing to follow LaSalle's systematic "problem method" plan, can rapidly qualify for a highly profitable, enjoyable lifetime career... and he doesn't have to finish his training before beginning to "cash in."

REASON #5. Without losing a day from your present work, you can prepare in spare hours at home, at low cost, under LaSalle's step-by-step "Problem Method" of "learning by doing." This famous plan accounts for LaSalle's remarkable record of having trained nearly 10 per cent of all Certified Public Accountants in the U. S. . . . and of having put many thousands of others into high-paying careers.

Send today for LaSalle's interesting booklets, "Accountancy, the Profession That Pays," and "Success Reports." Learn about the five great fields of opportunity . . . and LaSalle's time-tested plan for helping men and women to rapid advancement, higher income, greater prestige and professional standing. The coupon below will bring these fact-filled booklets to you—without cost or obligation—also, a free sample lesson showing LaSalle's famous "Problem Method" plan of instruction.

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- ☐ Bookkeeping
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- ☐ Auditing
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This One



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**GROOMS
HAIR,
NEVER
GREASES
IT!**

Do you shrink from that moment when she runs her fingers through your hair—afraid she'll find it oily? Then switch today to Mennen Cream Hair Oil. Lightly blended—leaves no trace. Contains lanolin. Helps remove dandruff scales, relieve dry scalp. Get it today—pass her Caress Test tonight!



MENNEN
Cream Hair Oil **FOR MEN**

(Continued from page 6)

its proper maintenance has become increasingly unhandy.

I've been looking over the artistic little booklet that came with our own gasoline wagon (vintage of 1941). A page and one half are devoted to the care of the finish; another page is dedicated to the care of upholstery. Then, lest my lady lack complete information, two whole pages give definite instructions for the removal of stains. It tells how to remove bloodstains, candy, chewing gum, fruit stains, grease and oil stains, ice cream, lipstick, paint and lacquer, shoe polish, water spots and the result of carelessness on the part of the baby. Now as for myself, I have never felt that a car really belonged to me until I could identify it by familiar smudges here and there on the upholstery. What I ask of a car is: How does it run?

The other morning our chariot began to sputter and spit with all the symptoms of water in the carburetor, so I looked in the book to see what it said about carburetors. A carburetor is a handy gadget to have on a car, but the book goes into no such detail as it does about upholstery and finish. It devotes 4½ lines to the subject of carburetion, stating that the carburetor was "carefully calibrated" at the factory and if anything goes wrong "consult your dealer."

My dealer was 25 miles away and I knew I would never make it, so I elevated the seat of my pants to the level of the car's roof and stood on one shoulder blade to remove the dampened carburetor. When I got it safely on the bench in my shop, I began to take it apart. To my surprise it presented no such mystery as the booklet had led me to believe. In fact it showed a great similarity to every carburetor I had ever seen. I cleaned it out, put it together and stood on my shoulder blade again. When I stepped on the starter the old engine purred like a kitten over a saucer of cream.

A widely circulated publication warns advertisers: "Never underestimate the power of a woman." Commercially it seems to be a woman's world, but I notice that when the floating drawing room fails to do its stuff, the little woman turns to a mere man to "make it run."

As one mere man, I would like to have a family car with a wheel on each corner so that I can get at the tires, an engine placed somewhere that I can get chummy with it, and a booklet, however arty, which lets me into the secrets of its innards.

One more thing. I would like it to have clearance enough so that I can straddle a hop toad without getting stuck.

(Continued to page 10)



HOW MUCH LONGER WILL YOU WAIT ...for another raise in pay?

"I'm \$100 a Month Richer"

"Got present job on strength of I.C.S. training. As result, I'm \$100 a month richer."
—H. A. Howell, Big Spring, Tex.



Changes Jobs Twice for Higher Pay

"Took Accountancy Course. Obtained two other jobs—each paying better than the previous. Would have been impossible without I.C.S. training."
—W. K. Watson, Lakewood 7, Ohio.



Income Increases \$120 Per Mo.

"My training really paying off. Already netting \$120 a month profit on my investment—with more to come."
—J. R. Todd, Crane, Texas.



NOBODY LIKES to keep asking for a raise in pay. And nobody likes to wait . . . and wait . . . for a raise that never seems to come!

Why not do the sensible thing? The quickest, surest way to GET higher pay is to make yourself WORTH higher pay.

Facing such problems, nearly six million people have turned to I.C.S. And year after year I.C.S. "comes through" for those who turn to it for help. For example, a recent Survey showed that, in one single 120-day period, 1973 I.C.S. students were promoted to better jobs!

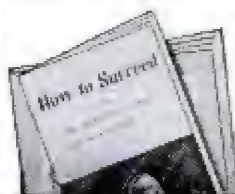
All This for Only a Few Cents a Day

You don't have to quit your job to get the training

you need in order to get ahead faster in your present field, or in a new one. And the cost to you is ONLY A FEW CENTS A DAY—and a fraction of the home spare-time which may now be getting you nowhere! You have your choice of 391 courses; and you get the personal help of one or more of our 203 expert instructors.

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Mail coupon for Free Book about subject you're interested in. Also, free, "How to Succeed"—36-page goldmine of advice on Why People Fail, How to Pick Your Goal, How to Develop Hidden Talents, etc. Take advantage of today's new job opportunities. Mail coupon, without obligation, NOW.



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- ☐ Magazine and Book Illustrating
- ☐ Cartooning
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- ☐ Aircraft Engine Mechanic
- ☐ Airplane Drafting

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- ☐ Arch. Drafting
- ☐ Building Contractor
- ☐ Estimating
- ☐ Carpenter and Mill Work
- ☐ Carpenter Foreman
- ☐ Reading Blueprints
- ☐ House Planning
- ☐ Plumbing

- ☐ Heating
- ☐ Steam Fitting
- ☐ Air Conditioning
- ☐ Electrician

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- ☐ Business Administration
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- ☐ Accounting
- ☐ Bookkeeping
- ☐ Stenography and Typing
- ☐ Secretarial
- ☐ Federal Tax
- ☐ Business Correspondence
- ☐ Personnel and Labor Relations
- ☐ Advertising
- ☐ Retail Business Management
- ☐ Managing Small Business
- ☐ Sales Management
- ☐ Salesmanship
- ☐ Traffic Management

CHEMISTRY

- ☐ Chemical Engineering
- ☐ Chemistry
- ☐ Analytical Chemistry
- ☐ Petroleum—Nat'l Gas
- ☐ Pulp and Paper Making
- ☐ Plastics

CIVIL, STRUCTURAL ENGINEERING

- ☐ Civil Engineering
- ☐ Structural Engineering
- ☐ Surveying and Mapping
- ☐ Structural Drafting
- ☐ Highway Engineering
- ☐ Reading Blueprints
- ☐ Concrete Construction
- ☐ Sanitary Engineering
- ☐ DRAFTING
- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Structural Drafting
- ☐ Sheet Metal Drafting
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- ☐ Electrical Maintenance
- ☐ Electrical Drafting
- ☐ Electric Power and Light
- ☐ Lineman
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- ☐ High School Subjects

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- ☐ Heat Treatment—Metallurgy
- ☐ Sheet Metal Work
- ☐ Sheet Metal Pattern Drafting
- ☐ Refrigeration
- ☐ POWER
- ☐ Combustion Engineering
- ☐ Diesel—Electric
- ☐ Electric Light and Power

Stationary Steam Engineering

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- ☐ General Radio
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- ☐ Radio Servicing—FM
- ☐ Television
- ☐ Electronics
- ☐ Telephone Work
- ☐ RAILROAD
- ☐ Locomotive Engineer
- ☐ Diesel Locomotive
- ☐ Air Brakes
- ☐ Car Inspector
- ☐ Railroad Administration
- ☐ TEXTILE
- ☐ Textile Engineering
- ☐ Cotton Manufacture
- ☐ Rayon Manufacture
- ☐ Woolen Manufacture
- ☐ Loom Fixing
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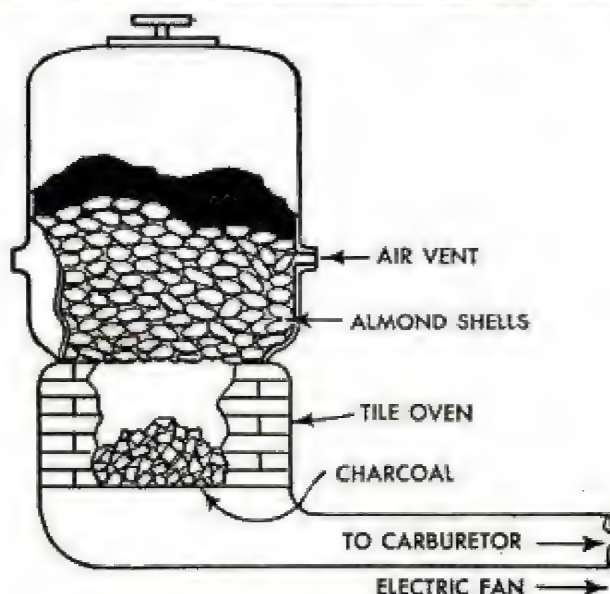
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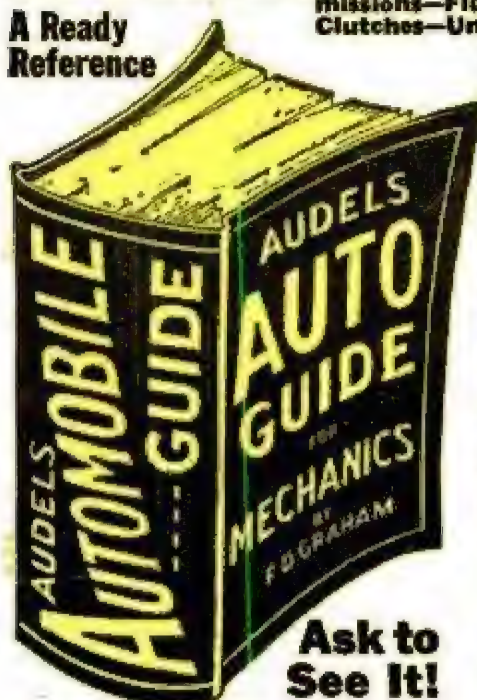
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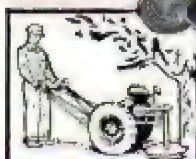


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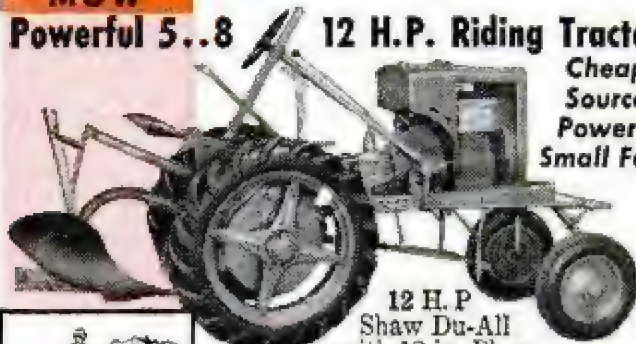
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WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available

AUTOMOTIVE

Hudson's new light car—the Jet.....	113
Specifications of the 1953 cars.....	118
Scoreboard of 1952 automobile production.....	120
Taillight quiz.....	129
The old and the new.....	134
Studebaker sparks '53 line with its sleek sportster.....	136
American sports car designed for mass production.....	137
"Singing" safety lanes provide warning for motorists.....	139
Demountable cabs speed engine repairs on snub-nosed trucks (Autocar Co., c/o Gray & Rogers, 12 S. 12th St., Philadel- phia 7, Pa.).....	183
Quickly applied tire chain (Cleveland Chain & Mfg. Co., Cleveland 5, Ohio).....	310

AUTOMOTIVE ACCESSORIES

Folding auto-snack tray (Engineering & Sales Co., 323 Vir- ginia Ave., Indianapolis 4, Ind.).....	137
Adjustable plastic safety filter reduces headlight glare (Ole- car Light Controls Co., Box 23, LaGrange, Ill.).....	138
Mobile unit gives auto radiator quick test (Inland Mfg. Co., 1108 Jackson St., Omaha 8, Neb.).....	142
Children's auto seat permits standing while riding (Dennis Mitchell Industries, 4424 Paul St., Philadelphia 24, Pa.).....	152

AVIATION

Alert-hangar doors yawn open in 30 seconds (Butler Mfg. Co., Kansas City, Mo.).....	88
Predict intercity helicopters for short-distance runs.....	152
"Lemon powered" autopilot for lightweight aircraft (Sum- mers Gyroscope Co., 2328 Broadway, Santa Monica, Calif.).....	164
Power of jet engine is 10 times that of B-29 (Westinghouse Electric Corp., Aviation Gas Turbine Div., Philadelphia, Pa.).....	184
Supersonic transport planes are years away, says expert.....	280

FARMING

Grain combine dries as it harvests crop (Bishop Engineering Co., Box 5021, Dallas, Tex.).....	95
Electric tractor uses trolley-type cable to reach power supply.....	138
Corrugated-rubber floor in Swedish barn uses no straw.....	163

HOUSE AND HOME

Three-section skillet (Fireside Shop, 950 Lincolnway East, South Bend 18, Ind.).....	140
Shopping reminder (Felix Glatz Import Co., Inc., 14 W. 23rd St., New York City 10).....	140
Removable door (Tappan Stove Co., 250 Wayne St., Mansfield, Ohio).....	140
Bottle-cap grip (Universal Sales Co., 4020 N.E. Cully Blvd., Portland 13, Ore.).....	140
Wallpaper squares (Wall-Dec Co., 228 E. 45th St., New York City 17).....	140
Lamp unit (W. N. de Sherbinin Products, Brookfield, Conn.).....	141
Tray attachment (M.B.P. Corp., 976 Sacket Ave., New York City 61).....	141
Automatic cleaner (Kinnard, Inc., Little Falls, N. J.).....	141
Table-top oven (West Bend Aluminum Co., West Bend, Wis.).....	141
Swinging tray (Herman Miller Furniture Co., c/o Alfred Auerbach Associates, 130 W. 57th St., New York City).....	141
Scenic wall panel for future rocketmen (Walcraft Studios, 11668 Terryhill Place, Los Angeles 49, Calif.).....	178
Two-way "chatterbox" keeps constant contact (Best Value Sales Co., 270 W. 39th St., New York City 18).....	179
Folding steel legs (Institutional Sales Co., 4932 Portico St., Philadelphia 44, Pa.).....	274
Rust preventive for home use can be sprayed or brushed (Galvanite Corp., 40 W. 29th St., New York City).....	290
Ice "cubes" drop in basket in automatic refrigerator (Servel, Inc., Evansville 20, Ind.).....	300

INDUSTRY

Truck lift transports fishing boats to water's edge.....	142
Increased water use caused by new industries.....	152
Barge-borne sulphur plant floats to bayou site.....	157
Hand rotary pump moves liquids in either direction.....	171
Smoke meter tests air with radar microwaves.....	171
Cable serves TV and telephone.....	310

MILITARY AND NAVAL

Amphib lands big tank ready for combat (Pacific Car & Foun- dry Co., Renton, Wash.).....	89
Bottled-gas lamp produces infrared rays for military use.....	138
Pressurized suits.....	157
Marine "hit and git" raids harass Reds.....	170

OFFICE, SHOP AND STORE

Calculator results are automatically printed by typewriter (Benson-Lehner Corp., 2340 Sawtelle Blvd., Los Angeles 64, Calif.).....	139
Device applies cemented tape to wallboard joints (Debs Deco- rators, Old Middleton Road, Madison 5, Wis.).....	152
Telephone holder (Office Appliance Co., 159 New Montgomery St., San Francisco, Calif.).....	179

PLASTICS

Floating plastic dome could cover stadium.....	87
Transparent wound dressing.....	139
Plastic die takes 100-ton pressure to form truck panels.....	148
Plastic floor tile with honeycombed back needs no adhesive (Robbins Floor Products, Inc., Tusculumbia, Ala.).....	153

(Continued to page 14)



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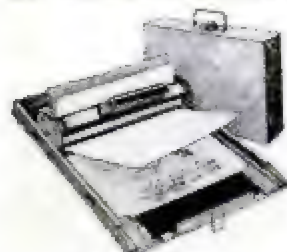
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(Continued from page 12)

Welding liquid mends broken plastic articles (Postmatic Co., 1549 Belfield Ave., Philadelphia 41, Pa.).....164
Glass-fiber storm panel resists hurricane winds (Russell Reinforced Plastics Corp., Lindenhurst, L. I., N. Y.).....177
Modeling plastic for artists and amateurs (General Glaze Corp., 100 E. 20th St., Baltimore 18, Md.).....178

SCIENCE

Sunspots may be the principal cause of warmer weather....142
Space travel poses knotty problem for future voyagers....148
Analyze fish noises for clue to detection....157
Radioactive material emits powerful glow....165
X rays show presence of weevils inside wheat grains....171
Selective chemical kills pond scum....184

MISCELLANEOUS

Dutch plastic bicycle.....16
German bobsled utilizes short skis as runners.....88
Paddle wheel creates artificial surf in German pool.....95
Radiophones clear Canadian winter roads.....95
Snagproof Zipper detaches when clogged (Snag-Proof Zipper Corp., 525 W. 52nd St., New York City 19).....137
Outboard-motor auto-lift hood (Evinrude Motors, 4143 N. 27th St., Milwaukee 16, Wis.).....139
Planes herd ducks to refuge.....163
Dutch church is constructed with "accordion" walls.....164
Boats sheathed in glass with workshop kit (Owens-Corning Fiberglas Corp., Toledo 1, Ohio).....165
Home-movie projector has simplified design (Eastman Kodak Co., Rochester 4, N. Y.).....170
German movie camera held horizontally.....177
Tiny glass balloons form strong aggregate.....177
Book riffling helps lip-readers.....183
Face washer for handicapped attaches to faucet.....183
Fish alarm for sleepy anglers (Land-O-Tackle, Inc., 3720 W. Grand Ave., Chicago 39).....284

Craftsman and Shop Notes Index

AUTOMOTIVE

Auto-license plates reinforced by hardboard backing.....197
Cleaning automobile floor mats.....207
Tape around wire splices secured with weather-strip cement.....210
Shock absorbers eliminate bounce of small wheel on trailer.....221
Chain placed around truck tire guards against "exploding" rim.....237
Tire mounted on service truck prevents scratched bumpers.....242

FARMING

Rotary tiller speeds digging of pipe-line trenches.....195
Protecting empty grain sacks.....232
Discarded auto tires and rims fitted to tractor wheels.....232
Operator rides small lawn roller to provide necessary weight.....242

HOBBIES AND NOVELTIES

Novel domino set made from cornstalk pith.....195
Old brass keys make unusual pins.....197
Model-railroad car painted easily when held with ruler "handle".....200
Mystifying tricks with color for your next party.....221

HOUSE AND HOME

Hacksaw blades used in slicer.....197
Solving home problems.....198
Sound of telephone ringing amplified by pan on floor.....200
Door key attached to clothespin hidden easily outside house.....205
Holder for steel wool.....205
Burned-out pilot light removed by paper "wrench".....207
Turns of wire around pipe leak reinforce liquid-solder patch.....207
Rubber glove rubbed on mohair to improve vacuum cleaning.....210
Trim dresses up square archways.....212
Television hassocks.....213
Photoflood reflector doubles as pin-up lamp.....218
Adhesive tape over saw teeth safeguards wall surface.....219
Gutter cleaning in winter weather simplified by using ice and rope.....220
Two-wheel cart made from scrap materials serves multiple uses in home and garden.....221

OFFICE, SHOP AND STORE

Paper glue-cup holder made from tin can.....197
Safe wire-stripping method.....200
Newspapers tacked to workbench kept handy for paint jobs.....207
Handy tool rack for workbench from corrugated-metal strip.....212
Difficult inside measurements made easy by quick caliper.....212
Improvised air syringe for shop.....212
Staples prevent sticking pages.....218
Magnets "tack" notices to bulletin board made of plywood covered with sheet steel.....220
Tiny d.c. "power pack" uses flashlight batteries.....225
Socket-head-screw wrench improvised in emergency.....232
Ruling compass adjusted quickly when rolled along drawing board.....237
Notches identify padlock keys.....237
Scraper on janitor's push broom made from corrugated hose.....246
Artist makes "water fountain" out of whipped-cream can.....246

(Continued to page 16)

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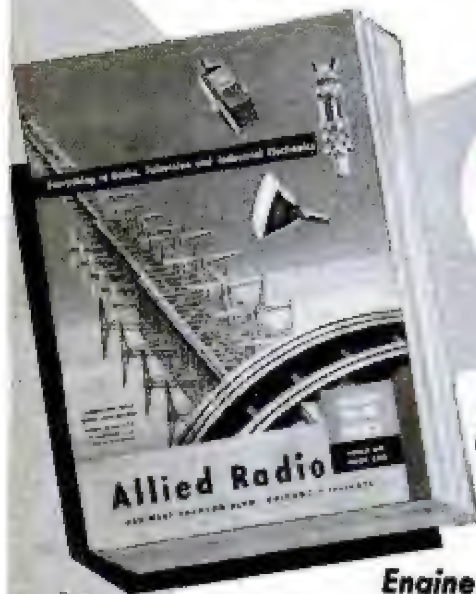
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(Continued from page 14)

PHOTOGRAPHY

Portable slide viewer.....	226
Data chart held in belt loop of exposure-meter case.....	228
Dustproof bags for film holders.....	228
Rubber-covered wedges to tilt enlarger easel.....	228
Folding-camera neck strap is inexpensive attachment.....	228
Front support for extended camera.....	229
Print dodging precaution.....	230
Protecting flash-gun reflectors.....	230

TOOLS

Adjustable cone mandrel.....	231
Large-diameter holes drilled with adjustable boring bar.....	242
Wrench kit (Moody Machine Products Co., Inc., 42-46 Dudley St., Providence, R. I.).....	243
Hand-operated printing press (Craftsman Machinery Co., 577 Atlantic Ave., Boston 10, Mass.).....	243
Radial saw (Shopmaster, Inc., 1214 S. 3rd St., Minneapolis, Minn.).....	243
Trailing caster.....	244
Combination power tool (Stanley Electric Tools, New Britain, Conn.).....	244
Speed reducer (Babcock & Co., 8253 Claremont Ave., Oakland 18, Calif.).....	244
Ornamental cap (Snap-Cap Screw Corp., Box 244, Englewood 5, R. I.).....	244
Three-spindle turret (Commander Mfg. Co., 4225 W. Kinzie St., Chicago 24).....	244
Dimensional air gauge (Federal Products Corp., 1144 Eddy St., Providence 1, R. I.).....	245
Vacuum cleaner (House of Ideas, Racine, Wis.).....	245
Electroplater (Yorktown Special Products Co., 25 E. Broadway, Red Lion, Pa.).....	245
Honing machine (J. C. Moore Industries, Box 234, Fredonia, Pa.).....	245
Cam-type vise (Wilton Tool Mfg. Co., 925-41 Wrightwood Ave., Chicago 14).....	245
Interchangeable reamers (Tomkins-Johnson Co., Jackson, Mich.).....	245

WOODWORKING

Illuminated wall cabinet.....	196
Make your own garage door.....	201
Plan of the month—gossip bench.....	208
Rustic smoking set made from piece of log.....	210
Portable "beauty shop".....	211
Pagoda shelves set motif for figurines.....	219

WORKSHOP HINTS

Section of rubber tubing provides round sanding block.....	195
Handle for carrying saw blade.....	195
Prepare brush before shellacking.....	205
Improvised bandsaw tire.....	210
Put a brilliant finish on plastics with ordinary polishes.....	211
Paint can secured to ladder.....	212
Tape applied with one hand.....	212
Hole "drilled" in glass with molten lead.....	218
Bar-clamping wide work.....	220
Hammer claws provide handy scale for determining drill sizes.....	230
File taped on hacksaw frame notches work for easy start.....	232
Electric-drill cord held by attached spring clip.....	232
Extra carpenter's pencil kept handy.....	237
Preventing countersink chatter.....	242
Grooved block aligns jigsaw blade for accurate chucking.....	246
Lock wrench held in bench vise grips work while cutting.....	246

MISCELLANEOUS

Shellac used as thread dope.....	195
Kink for cleaning spectacles.....	197
Miniature grease gun from pencil.....	200
Snow scooter is light and swift.....	206
Lipstick-tube container stores spare flints and small parts.....	207
Safety pin holds pen in pocket.....	212
Sander for model builders from electric-fan unit.....	218
Section of garden hose slit to make riding quilt.....	237

Radio-Television, Electronics

Communications receivers feature dual conversion (National Company, Inc., 61 Sherman St., Malden 48, Mass.).....	247
Twenty-watt super-fidelity audio amplifier has low distortion.....	248
Slip-on spindle replaces record inserts (RCA Mfg. Corp., Camden 2, N. J.).....	252
Silent "mike" stenography (Talk, Inc., 261 Constitution Ave., Washington 1, D. C.).....	252
Desk-type clock radio (RCA Victor Corp., Camden 2, N. J.).....	252
Remote-control switch for radio or TV (Breck's of Boston, 401 Summer St., Boston 10, Mass.).....	252
D.C. to a.c. converter for your car (Terado Co., 1088 Raymond Ave., St. Paul 8, Minn.).....	252
Valet for a phonograph record (Mystik Adhesive Products, 2635 N. Kildare Ave., Chicago 39).....	252

Dutch Plastic Bicycle

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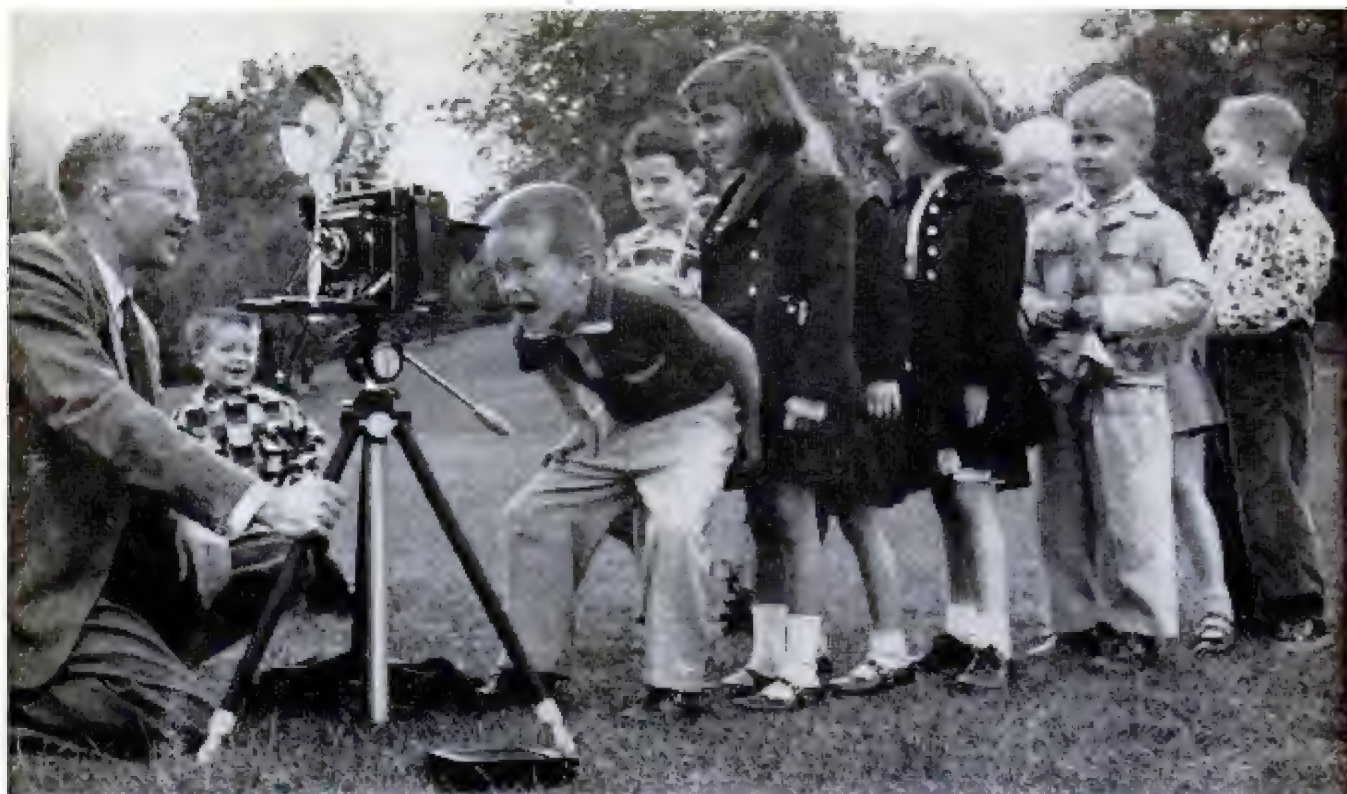
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era. They lined for the operation and the lead man let out a yell, "Hey! Everything's upside down," when he saw what he saw. While Art was explaining the fine points of photography to the young fry, Don Honick, staff photographer, snapped the picture.



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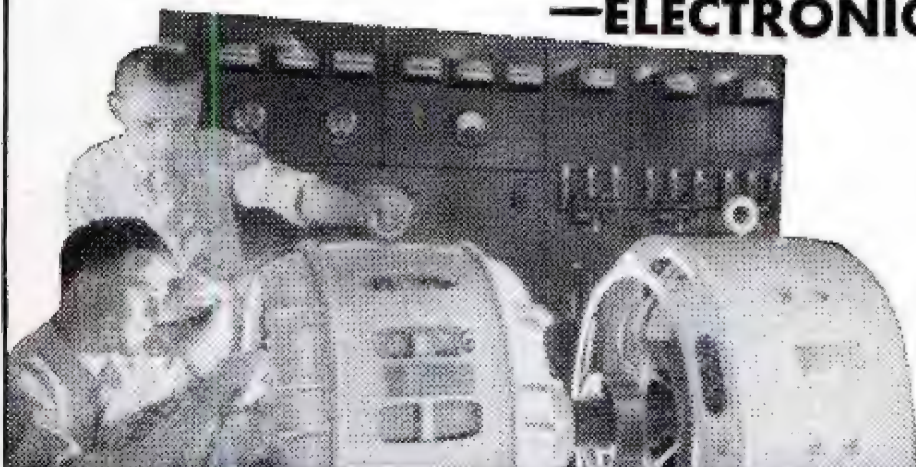
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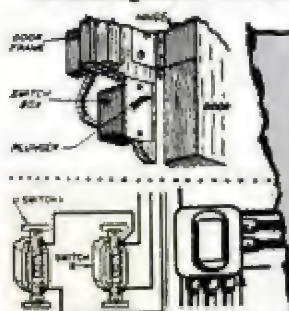
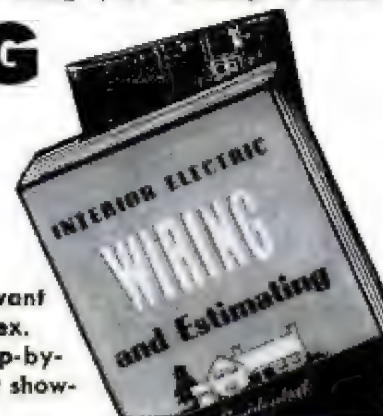
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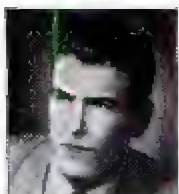
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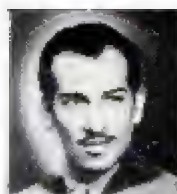
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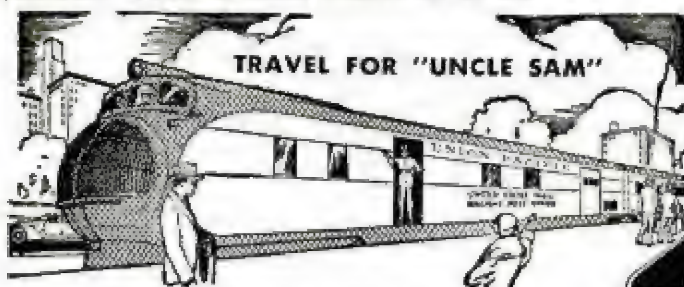
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Start on a SHOESTRING!

The real-life stories of success in Mail Order read like fairy tales. If I had not personally known these people their stories would be hard to believe. Yet they are not only true, but they represent just a few of the hundreds of “little operators” who have been swept into big money by Mail Order.

GAINES. I personally guided his start when he invented an automatic pants presser. He started with one little ad in one magazine. Four years later he retired — with enough real estate to keep him in cash income the rest of his life.

YAN MARK. I worked with him for six years. I met him when he was a wagon man for a tea and coffee house, knocking on doors. He went into Mail Order on nothing—made money from the start—ended up six years later with savings of \$50,000 and an income of \$5000.00 a year for life without further work.

DUGGAN. A few years ago he was a truck driver. Started fooling with Mail Order in a spare room in his spare time. Last year he said, “I don’t know how much I’m worth—after you get the first million you quit keeping track.”

MRS. NIXON. Started a small Mail Order business at home—just to keep occupied. It looked good and she came to me for advice. I showed her how to expand. In two years the business got so big her husband resigned his job to help manage it.

FOXMAN. Foxman worked as a hack writer at \$70 a week. He had idle time in the evenings—ran an ad offering something he didn’t have—got so many orders he had to find a source of supply. He made \$18,000 the first year. He gives me credit for “showing the way.”

JORGENSEN. Consulted me about a specialty product. On my advice he ran one ad to “test” its saleability. That ad brought sales of \$50,000. In his first year he did a business of nearly a half million dollars. His original investment was less than a thousand.

These things I have seen. These people I have helped to the realization of their dreams — these and hundreds of others. My own fortune was made in Mail Order. And now my secrets can be yours.

L. W.

Have you ever thought of running a profitable little sideline right from your home? Has it occurred to you that you are just as capable as anyone else of making money on a product or service that can be sold by mail? Have you ever looked into the Mail Order business as it’s run (on tiny investments) by innumerable small operators?

Forget about Sears and Ward’s! Read about the “little fellows” . . . clerks, teachers, vets, mechanics, salesmen and others . . . who are packing Mail Order items in bedrooms, spare rooms, attics, garages, cellars . . . dumping them in the Post Office . . . and quietly banking the fistful of Money Orders, cash and checks delivered to them daily by the mailman.

An annual business of almost a billion dollars is done by “little fellows” who advertise and sell just one item! The Department of Commerce of the United States says, “A number of the most successful obtain incomes as high as \$40,000 to \$50,000.00.”

It’s an incredible story . . . a story of a business that’s wide-open for newcomers . . . with opportunities for income far-and-away greater than you can ordinarily hope to attain by holding down a job. And in Mail Order you can stay as small as you wish—run your deal as a \$50 or \$75 weekly sideline—or consider jacking it up into really big figures as a full time operation.

Glance at the examples at left. These true stories are far from unusual. Multiply them by the hundreds and you begin to get an idea of what can be done . . . what is being done . . . in the phenomenal Mail Order field.

Yet, if you were to jump blindly into Mail Order your chances would be slim. A peculiar brand of “know-how” is vital in this little-known, little-understood business. This is fortunate for you. If any Tom, Dick, or Harry would “click” in Mail Order, the field would have been overloaded years ago.

But now you have the opportunity to learn the authentic secrets of successful Mail Order operation. They are revealed for the first time, step by step, in an extraordinary new Survey . . . the L.W. Confidential Mail Order Letters.

This Survey is not a course—not a book—not a group of lessons. It is a simple guide that anyone can follow. It shows you how to pick the right product for Mail Order. It shows you exactly how to start a profitable business fast, with cash or Money Orders in the envelopes you receive. It shows how to buy your product out of the very money you get in the mail, so you don’t have to tie up cash in large supplies of your product. It gives you actual examples of ads and letters, analyzed to show how and why they make money. It demonstrates the months to start, the time to expand, the best way to get prospects’ names. It reveals from A to Z the confidential facts that have made fortunes for Mail Order operators who use them.

Mail the coupon today, or simply send your name and address on a postcard. No salesman will call. We will mail, postage prepaid, a Free copy of “How to Become a Mail Order Millionaire” and along with it will give you complete facts about the L.W. Mail Order Survey. Read the facts. Then decide whether you would like to spend spare time or full time in a profitable, fascinating Mail Order enterprise. If you think you would like to follow the footsteps of hundreds of others who are now making good money in this way, you can get your L.W. Survey and begin at once.

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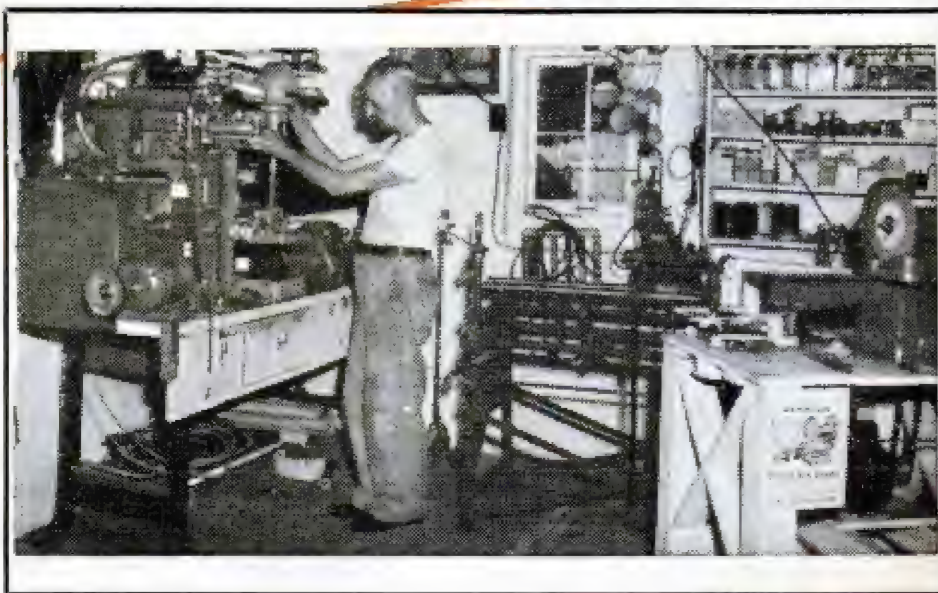
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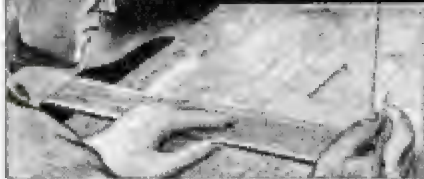
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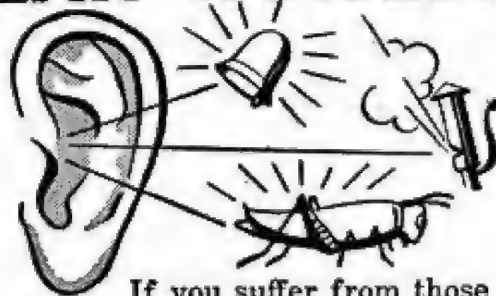
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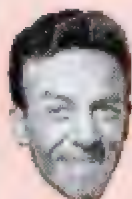


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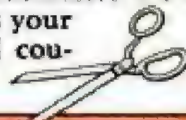
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700-16	6.42	760-15	6.02	750-15	13.92	900-20	17.22
750-16	9.22	800-15	6.52	825-15	12.92	1000-20	17.72
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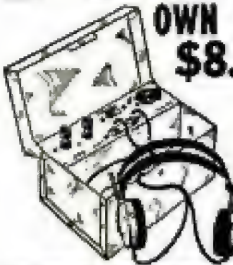
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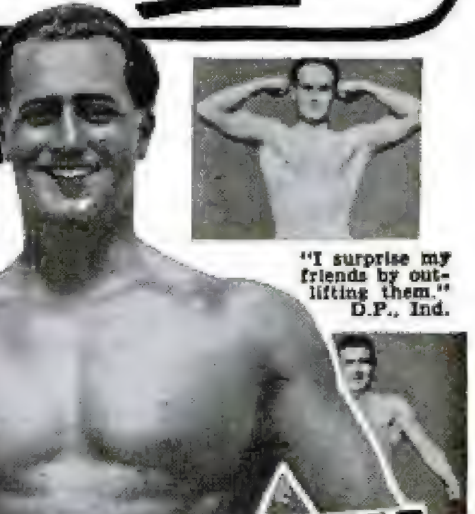
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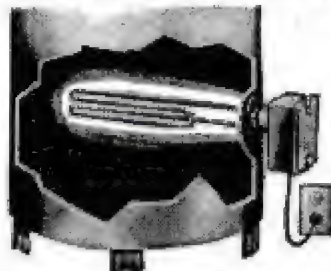
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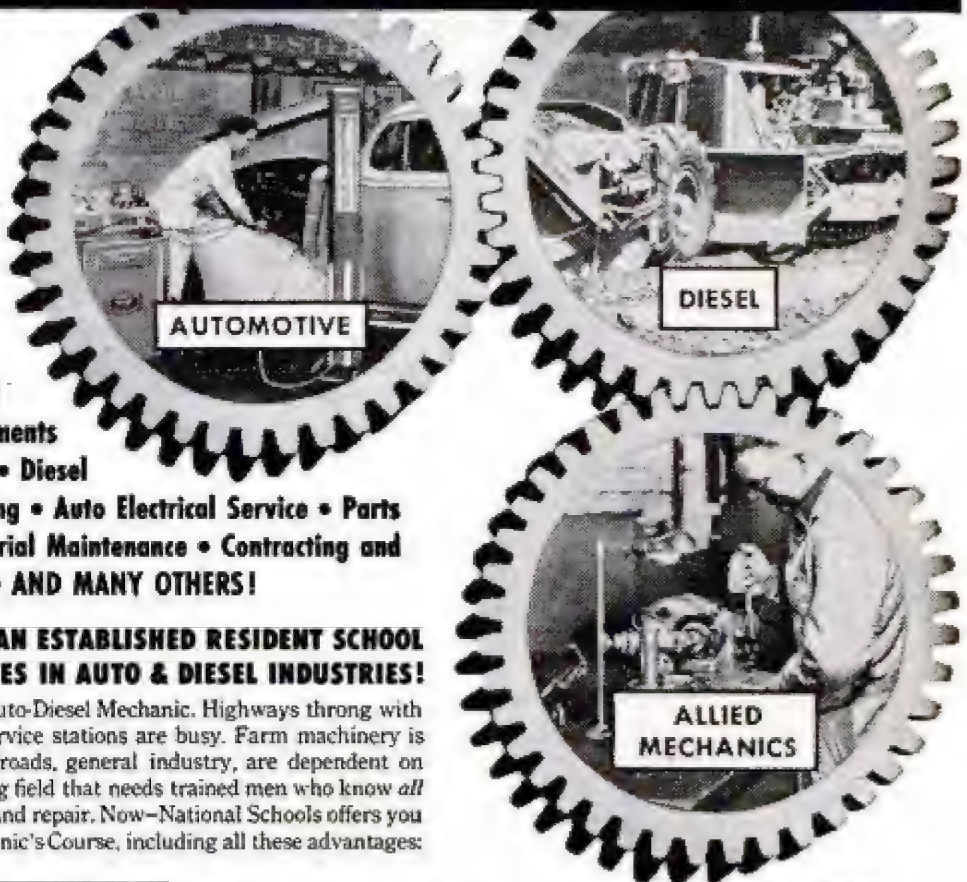
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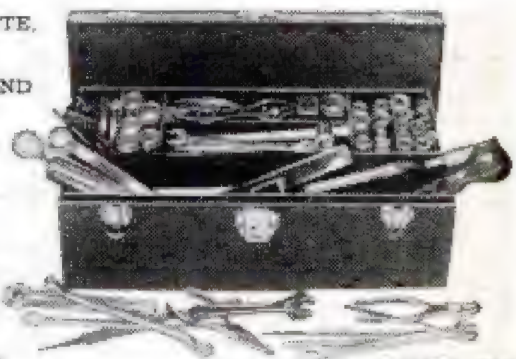
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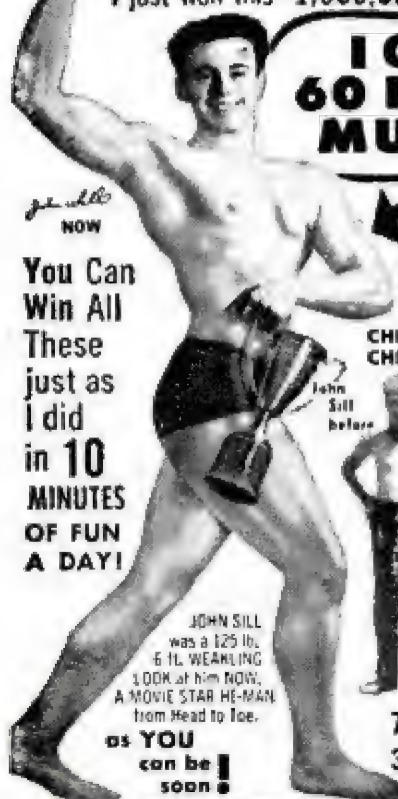
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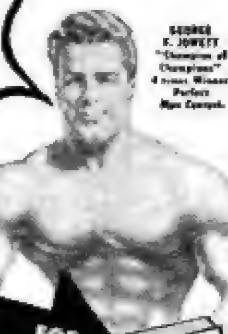
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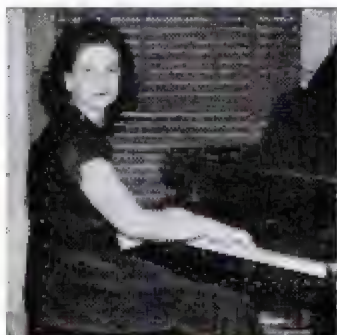
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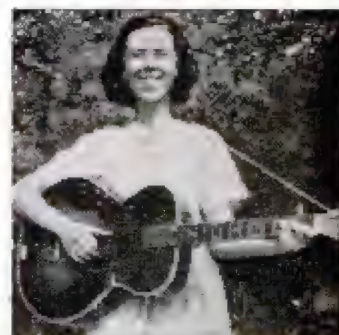
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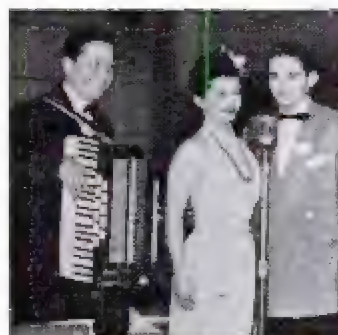
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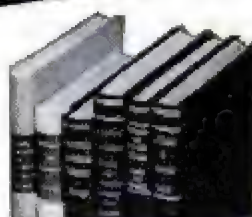
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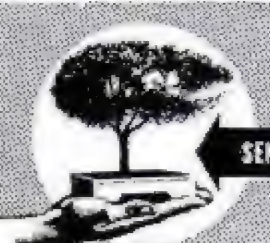
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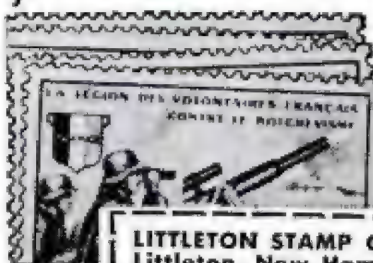
Now it's **EASY** to get started. Right **WITH** the 235 Free Stamps described above we will send you a Complete Stamp Collector's Outfit. If you decide to keep it, it's **ONLY ONE DOLLAR**. But if you **DON'T** think it's a big bargain, send it back—we'll refund your dollar **AND YOUR POSTAGE, TOO!**

The Outfit contains the five items at left... **EVERYTHING YOU NEED** to start a stamp collection that can grow in value for the rest of your life!

Examine Kit for 7 Days Without Risk!

Mail coupon and \$1 now. The complete Outfit—together with the 235 Free Stamps and other interesting offers—will be sent for a week's examination. Unless you're delighted, return it—we'll promptly refund your dollar and your postage, too! **LITTLETON STAMP CO., Dept. 2-PM, Littleton, N. H.**

5 stamps issued by German-Occupied France to popularize idea of Volunteer Frenchmen helping Nazis fight Soviet Russia. This set (now obsolete) much sought after! **FREE** while supply lasts even if you decide **NOT** to keep Kit! So mail coupon **NOW!**



LITTLETON STAMP CO., Dept. 2-PM Littleton, New Hampshire

Send me, **FREE**, 235 foreign stamps—and a set of **ANTI-COMMUNIST STAMPS**, while supply lasts. Also send for 7 days' examination Complete Stamp Collector's Outfit.

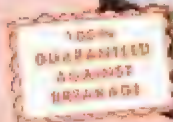
I enclose \$1 as deposit. After 7 days' examination, I may return everything (except **ANTI-COMMUNIST STAMPS** which I may keep **FREE**) and you will return my dollar **AND** my postage. Or I will keep everything and you may keep my dollar as payment in full.

Name _____
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New! GIANT BEACH BALL OVER 3 FEET HIGH

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Introductory Offer!

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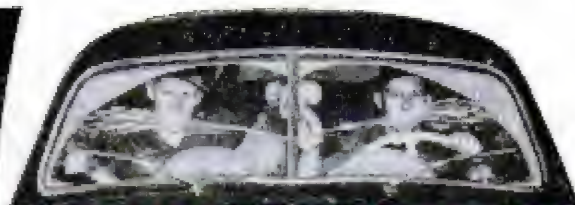


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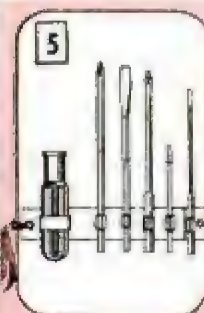
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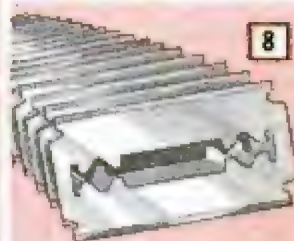
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\$15²⁰ an hour!

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Why Large Presto Profits Are So Easy

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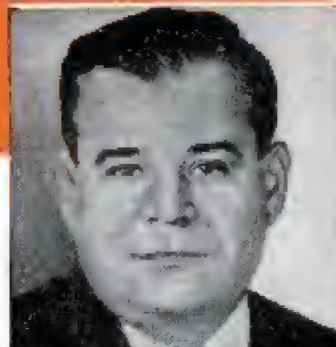
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WILLIAM F. WYDALLIS

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*William F. Wydallis
Van Wert, Ohio*



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650x15	4.34	650x20	7.84	750x20(8)	8.84	1000x20	14.14
700x15	4.84	700x20(8)	8.84	750x20(10)	9.94	1100x20	16.14

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640x15	5.68	750x16(8)	8.98	650x20	10.88	1000x20	19.98
650x16	5.78	800x15	6.88	700x20	12.88	1000x22	21.98
650x16(8)	6.98	820x15	7.48	32x6(8)	10.48	1100x20	20.98
650x15	5.98	710x15	6.09	32x6(10)	12.48	1100x22	21.98
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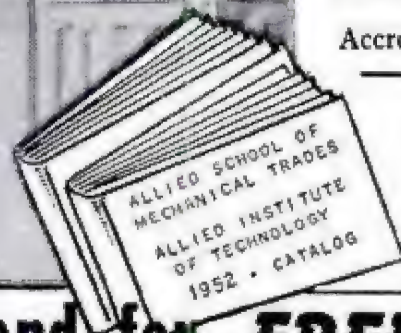
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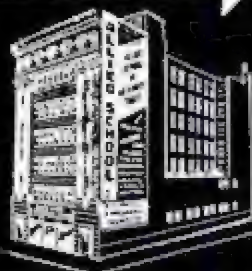
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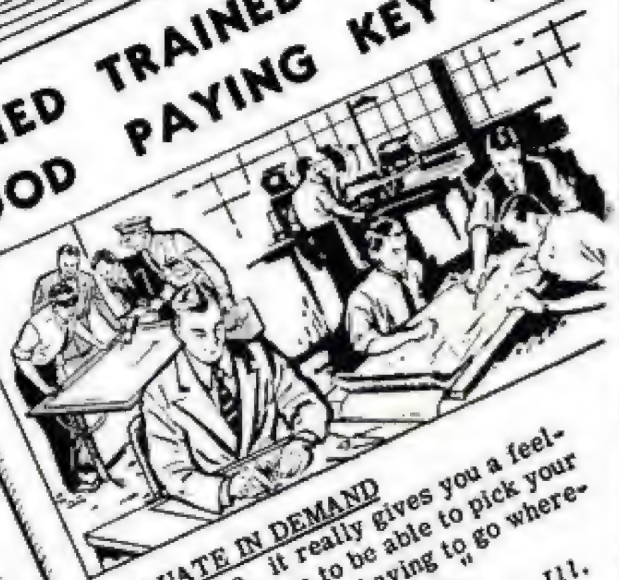
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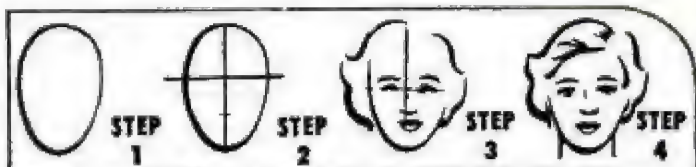
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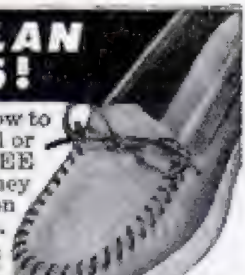
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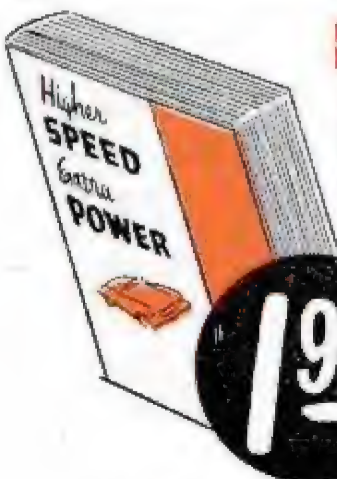
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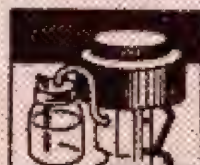
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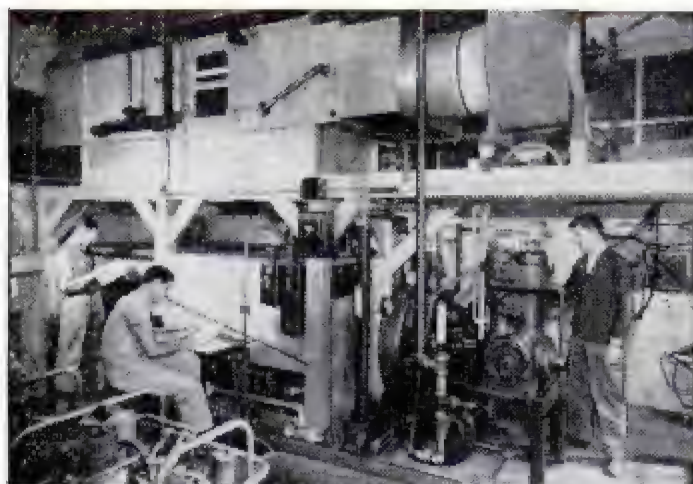
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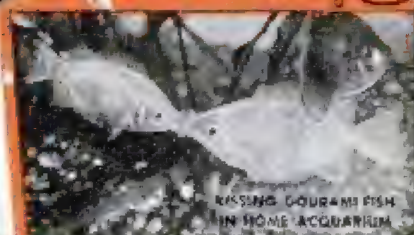
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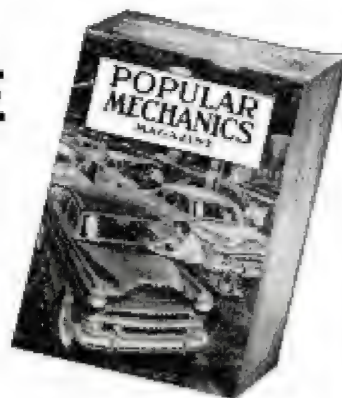
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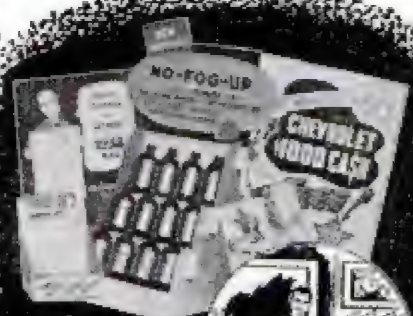
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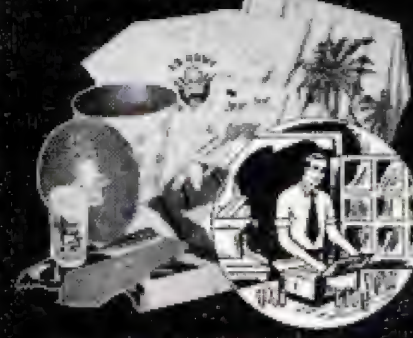
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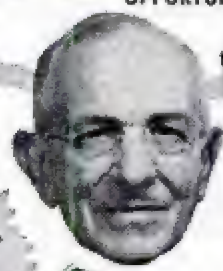


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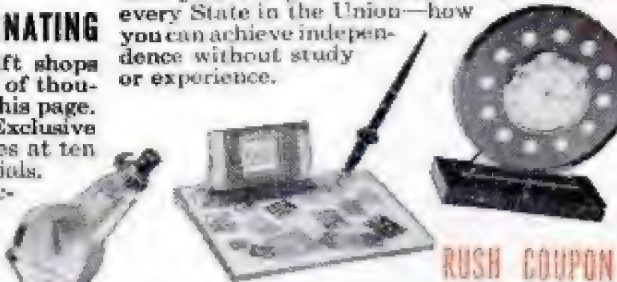
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10,000 PENNY Approvals waiting for you. Many from exotic countries, pictorials, airmails, new issues. Tilbury, Box 862, Newark 1, N. J.

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50,000 STAMP Grabbags 25c each. Anderson, 630B Bingham, Reading, Penna.

OLD STAMPS WANTED

I Will pay \$100.00 each for 1924 1c green Franklin stamps, rotary perforated eleven (up to \$1,000 each unused). Send 10c for large illustrated folders showing amazing prices paid for old stamps, coins and collections. Vernon Baker, PM-32, Elyria, Ohio.

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4 ANCIENT Indian arrowheads \$1.00. Fine grooved tomahawk \$3.00. List free. Lear's, Glenwood, Arkansas.

4 PERFECT Arrowheads \$1.00, tomahawk \$1.00, pestle \$1.00, flint knife 50c, hide scraper 50c, stone axe \$3.00, perfect pipe \$3.00. Catalog 10c. H. Daniel, Lamar, Ark.

ANTIQUE, Pistols, flintlocks, muskets, swords, list 25c coin or stamps. Westbrook, 5537 Lafayette Street, New Orleans, Louisiana.

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TEN New Mexico minerals \$1.50, six fluorescents \$1.00, fool's gold 25c. Free literature. Minerals, Winston, New Mexico.

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QUARTZ, Jasper, agate and catalog 25c. Gemco, Elkhart Lake 2, Wisconsin.

GEMSTONES, Mineral specimens. Every variety. Lowest prices. Postcard brings free booklet. Plummer's, 4720 Point Loma Ave., San Diego 7, Calif.

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GEMS And minerals, beautiful magazine tells how to cut and collect. Brochure and book list free. Gembook Co., Palmdale, Calif.

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FIGURINE Molds and many others, liquid rubber, statuary plasters, flock finishes, Glo-candle wax, etc. Illustrated catalog and "Plastercraft" manual free. Blue Rapids Supply, Blue Rapids, Kansas.

START Home manufacturing business. Make cleaners, soaps, polishes, cosmetics. Free literature. Kemix, Park Ridge, Ill.

HOW And where to obtain capital? Free details. Star Service, Wapakoneta, Ohio.

BIG Profits making new greaseless doughnuts. Start in kitchen. Wholesale to grocers and cafes. Free plans. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minnesota.

BIG Money and fun growing live miniature Ming trees on your window sill. Write for free rare tree seed and plan. National Nursery Gardens, 8463 South Van Ness, Ingleswood 4, California.

MAKE Money spare or full time, casting metal toys and novelties. Big wholesale and chain store demand for autos, soldiers, ashtrays, banks, etc., keeps manufacturers busy. Production moulds furnished for up to 100 and more castings per hour. No experience or special place necessary. Write for information and illustrations of patterns needed. Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.

NEW Exceptionally profitable plans, ideas for home operated mail business. Rush name. Miller, 1772-P Carlyon Road, East Cleveland 12, Ohio.

MAKE Flexible molds! Cast plaques, bookends, figurines! Free sample! H. Tooker, 630-R Chestnut, Hamilton, Ohio.

21 POPCORN, Candy apple formulas, proven money-makers. Send \$1 today for formulas, catalog of money-making ideas. Concession Supply, 3916 Secor, Toledo, Ohio.

RECAST Old batteries into new. Latest achievements. Battery Laboratories, Minneapolis.

READ "Advance"—The voice of mail order. Offers money-making opportunities, sources of supply, personal guidance, etc. Issued monthly. Sample copy 35c. Yearly subscription \$2.00. Advance Publishing Company, 313 East 21st Street, Suite 450, New York 10, N. Y.

GOOD Paying business silvers mirrors, plating autographs, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required. Outfit furnished. Free booklet. Gunmetal Co., Ave. H, Decatur, Illinois.

BUY Wholesale. Thousands articles. Supply directory, 10c. Idealco, Park Ridge, Illinois.

EARN Extra money! "Homeworker Magazine" tells how. Sample 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30.

EXTRA Money—No selling, operate vendors. Amazing profits, details free. Silver King, Suite 320, 622 Diversey, Chicago 14.

BUY It wholesale! Manufacturers, distributors offer 650,000 items. Literature free. Olsen, 1231-A East Third St., Duluth 5, Minn.

OPERATE Profitable mail order business. Write Walter Service, 4189-A East 112th, Cleveland 5, Ohio.

EARTHWORM Breeding? First, get unusual story. "An Earthworm Turned His Life." Free. Earthmaster, Dept. 14, El Monte, Calif.

DOLLARS In personalized baby record books. Sell by mail. Use same literature we do. No-Co-Re, Oakland 6, Calif.

MADE \$24,500 Using money making plans from Schemer Magazine, world's oldest mailorder publication. Box 275M, Canfield, Ohio. Year \$2.00. Sample 20c.

MINK Raising information free. Complete. Lake Superior Mink Farm, Superior, EE1, Wisconsin.

COPUBLISH Leading m.o. paper. Latest copy. Mail Sale Advertiser, details, dime. Vanroy Shirk, Lebanon, Penna.

GET Dollar orders in your mail. Keep 90c. Everything supplied. Genmerco, Box 142-D, Dorchester 24, Mass.

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing, Money-making projects. Booklet, details free. Men only. National Potteries Company, Grand Rapids, Minnesota.

HOME Mail business! We supply exclusive product, advertising, everything. Experience unnecessary. Start low as \$150. Terrific potentialities. Write: NMD Agency, Box 88-D, Dorchester 22, Mass.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanside, Calif.

CHINESE Raised art. Fantastic profits. Easy enjoyable hobby. Details free. Modern Aids, 248 South Main, Jamestown, N. Y.

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POPCORN And potato chip equipment. Long Eakins Company, 5360 High, Springfield 99, Ohio.

1001 OPPORTUNITIES, Dept. P, Box 209, New York 28, offers real business-building aids and ideas. Free information.

START Venetian blind laundry. Profitable lifetime business. New machine. Free booklet. F. C. Co., 442 N. Seneca, Wichita 12, Kansas.

WANTED! Home producers, by manufacturers in our clearing house service. Become a sub-contractor, casting plastic products for these companies. You don't have to look for markets; we do the missionary work. Thousands of easy to make items required for consumer and industrial use. Cash in at home. No previous experience required. Write for free details. Plastic Service Associates, Dept. PM2, East Boston 28, Mass.

MAKE Money at home as renewal headquarters for all magazines. Liberal commissions. No experience, no capital needed. Supplies furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500B, Mount Morris, Ill.

BOOKKEEPERS, Increase earnings operating sensational bookkeeping service. C.P.A. system. Kern, 4943 Vineland, No. Hollywood, Calif.

NEW Fabulous home-business, "Jewelize" finish. Free money-making plan. Pearl-Art, 7216C Bear, Bell, Calif.

SELL Books by mail! Wholesale catalog, 25c. Monarch, Auburn, New York.

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MAKE Money from newspaper clippings. Siegel, Box 183 PM, New York 2.

BOOKKEEPERS—Earn up to \$520 month serving small firms part or full time. Proved plan; simplified system. Particulars free. Tax Saver System, Dept. 2, Fort Worth 2, Texas.

137 PLANS For starting home business. Details: Elite Co., 220 Grand St., New York 13.

Metalize, Permalize, ceramize, porcelainize, baby shoes, dolls, pottery, hundreds of items. No firing, no baking. Tremendous profits without costly equipment! Send 25 cents for complete business plan and illustrated instruction book. Professional Art Products, Dept. P.M.25, 245 S. Wabash, Chicago 5, Ill.

EARN Money with typewriter, sewing machine! Spare time! Details free. Edwards, 8915-PM, 12th, Des Moines 13, Iowa.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog free. Parkway Machine Corporation, Dept. 72, 715 Ensor St., Baltimore 2, Md.

MONEYMAKING OPPORTUNITIES

HUGE Profits, home business. Assemble rhinestone jewelry. Catalog 20c. Start today. Order gorgeous sample kit \$1.98. Completed sells \$8.50. House of Hobbies, Dept. C-9, Evanston, Ill.

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NEED Extra cash? Get it selling Blair's unusual line of household and food products. Every housewife a prospect. Send for samples free. Write Blair, Dept. 31LB-1, Lynchburg, Va.

EXPERIENCED Roof repairer. Franchise Protection. Luster-Kote, 19417 Derby, Detroit, Mich.

CHURCHES, Organizations, receive \$130.00, 12 card tables free. Unique Gift Plan, 28 East Second, Pine Hill, N. J.

\$10,000 PROFITS! Your own mailorder business! No capital risk! "Success plan" (worth \$2) free! Write today! Treasury, 149 Storer, New Rochelle PM-8, New York.

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START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-R Linden, Buffalo, N. Y.

FREE! Your own mailorder business! Everything furnished! No investment! Terrific profits! Write today. California Vitamins, 2910PM Beverly Boulevard, Los Angeles 4, California.

NEW Ideas and items free, samples to retail for \$1.00. Specialties, Box 475N, Park Ridge, Illinois.

30 MONEY Making hobbies, 60 markets for handwork 25c. Daisy Nickell, R-3, Box 94, Bend, Oregon.

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NEW T"x11" Signs—7c, sell 50c. 15 samples, \$1.00. Lowy, 812 Broadway, Dept. 712, New York 3.

LIVE Better. Live happier. Find security, profit in the country. Interesting facts free. Hermes Publishers, 152-E West 42nd St., New York.

OPERATE Fascinating newspaper clipping bureau! Profitable instructions 25c. Shroder, 803 Wisconsin, Peoria 4, Illinois.

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MAKE Extra money painting figurines at home. Free details. Sutter, 2735 N. 77th Ave., Elmwood Park 35, Illinois.

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JUNK Pays—All types. Know how, where get higher prices. Send \$2.00. Aztec, Box 32, Rock Island, Illinois.

MAKE Money like we do. Information telling how 25c. Money back guarantee. Pitt-Kans Company, Pittsburg, Kansas.

SELL Titania gems; \$9.75 carat wholesale. More brilliant than diamonds. Free catalogue. Diamonte, 1404-M Mitchell, Oakland 1, California.

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TIE-Breaker picture puzzles exposed, \$2.00. Wenograd, Box 1495, Philadelphia 5, Penna.

SCHUHMACHER Matmakers. Convert old tires into dollars. Devote full or spare time. S and S Patents, Inc., 1307 North Clark St., Chicago 10, Ill.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

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PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National. Ord. Nebr.

BE Appointed State Notary Public now! Details: Stationers, Helotes, Texas.

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SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassell Agency, Westfield 2, New Jersey.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801 North Marshall, A-5, Dallas 3, Texas.

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BOOKKEEPERS! Big earnings. Operate bookkeeping-income tax service. Latest amazingly simplified plans, \$2.00. Tackett's, North High, Salem 2, Indiana.

137 PLANS To make money, local mail-order. Details: Elite Co., 220 Grand St., New York 13.

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ANY Formula. Jack, Consulting Chemist, 5138 Gainer Road, Philadelphia 31, Penna.

GENUINE Manufacturing formulas. Latest. Literature free. Nelko, 3462-P Merchandise Mart, Chicago 54.

LUMINOUS Paint. Formula, selling plans \$1.00. Krysto Products, Pelton, Calif.

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LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", \$1.20; 1/8", \$1.40; 3/16", \$1.75; 1/4", \$2.05. Include 10% postage. Almac Plastics, 600 Broadway, New York City.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D-3B, Portland 13, Ore.

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NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved success plan showing how to make money at home. Castolite, Dept. B-101, Woodstock, Illinois.

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INTERNAL Carvers increase profits, make television or night lights. Now available, plastic lamp base completely wired, with slot in top to illuminate your carved plaque. Available in opaque black, translucent ivory or pink. Send for sample and prices, \$1.25 postpaid. Arata, Roberts and Browne, Inc., Towaco, N. J.

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NEW Chemical supply catalog, 15c, refundable. Laboratory Sales, Box 161-A, Brighton, Mass.

SECOND Printing, improved version, spectacular chemical fireworks experiments manual. Contains complete setups, formulas, instructions on thermites, fulminates, powders, etc. Still \$1.00 postpaid. Chem-Tech Laboratories, 568P Riley, Buffalo 8, New York.

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NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

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HOTTEST Seller ever! Get in on the ground floor! Huge profits await you as our agent selling full or part time new nationally advertised top quality Pennsylvania saw sets. Tempered steel saws for every use, all on one handle. Hacksaw, crosscut, frozen meat and bone saw, pruning saw, keyhole saw, dovetail saw. Tremendous value everyone can use, everyone wants! Sells on sight! Send for free illustrated catalogue. James R. Barnett Co., Dept. E, Box 188, Wellesley Hills, Mass.

LADIES! Need clothes and money? Easy to take dress orders. Big commissions in advance. Beautiful style presentation absolutely free! Send no money. Melville Co., Dept. 7928, Cincinnati 25, Ohio.

BONUS Suit plus big profits! Sell made-to-measure men's clothes. Fit, satisfaction guaranteed. Big values sell fast. Profits to \$11.50 per suit. Sample outfit free! O. K. Tailoring, 325 S. Market, Dept. 167, Chicago, Ill.

AT Last! Something new and sensational in everyday cards. 21 for \$1. Make extra money fast! Show satin, velour, metallic cards. Get orders easy. Big line \$1 assortments, scented stationery, personal matches, kiddie books. Imprints free. Three \$1 boxes on approval. Puro Co., 2801 Locust, Dept. 340-B, St. Louis 3, Mo.

NYLON Stockings all over the world. Rich Supply, 215a W. 98th, New York 25.

NEW "Sponge" wall cleaner. Erases dirt like magic. Wallpaper, painted walls, ceilings. Saves redecorating. Lightning seller. Samples sent on trial. Kristee 158, Akron, Ohio.

BIG Profits in spare time! I'll send free assortment full-size samples fine foods, household necessities to ambitious men—women who need money. Friends, neighbors buy eagerly. Send no money. Just write Blair, Dept. 311B-2, Lynchburg, Va.

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CLEANS Windows without mess. Strange "dry" cleaning cloth. Replaces liquids. Samples sent on trial. Kristee 157, Akron, Ohio.

NEW Easy way to make money! Show friends new ideas in all occasion greeting cards, gift wrappings, home and gift items. Big profits. Experience unnecessary. Request feature samples on approval and free samples exclusive name imprinted stationery, gold imprinted items. New England Art Publishers, North Abington 802-C, Mass.

BUY Wholesale thousands nationally advertised products at big discount. Free "wholesale plan." American Buyers, 629-R Linden, Buffalo, N. Y.

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A Postcard can put you in a fine business! Complete line. Leather jackets, 151 shoe styles. Big commissions. No experience, no investment. Send postcard for free outfit. Consolidated Shoe, Dept. CC-18, Chippewa Falls, Wis.

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BUY Wholesale—Thousands nationally advertised items. Save, make money! Free details. Durex Co., Box 672-L, Chicago, Ill.

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PROFITABLE Plastic items—Woody toothpick dispenser, Tidee thread box, bird cage plaque, sue server, grease-in-brush. Many other fast sellers. Write Sunshine Sales, Dept. PM-2, Loudonville, Ohio.

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SPARE-Time representative, pleasant interviews, lucrative. C. Knight, 19217 Schoolcraft, Detroit 23, Mich.

BARGAINS—Terrific savings. Job lots. Close-outs! Also save up to 50% on dry-goods, clothing, hosiery, notions, drugs, toiletries, gifts, jewelry, television, etc. 2000 items. Send 25c for wholesale bargain catalog with special "get acquainted" offer which includes free \$1.00 merchandise certificate. Reliable Jobbers, 311-B North Desplaines, Chicago 6.

PLASTIC Raincoats. Women's, men's. Samples \$2.50. Incredible. Moneymaker, Yale Clothing, Meriden, Conn.

YOU Will be bubbling over with profits by selling "Bubbles" and "Comic-Scope." Write or send \$1.75 for postpaid samples. Jay Sales, 5621 N. Clark, Chicago 40.

SELL Big money maker to men and women. Easy handwork makes fast-selling useful articles. Sample free. Sun-made Company, Brockton 64, Mass.

MAKE Your dreams of success come true! We can show you how. Sell direct exclusive Spring-Step cushion shoes—A new idea in foot comfort. Earn up to \$25 daily! Full or part time. Free sales equipment. Write today! Dept. PM23, Ortho-Vent Shoe Co., Salem, Va.

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FAST Profits—No investment. Plastic aprons, tablecloths, etc., 300 sure-fire items. We guarantee sales. Free information. Halliday Co., Dept. PM, 15 Pennington Ave., Passaic, N. J.

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\$10-\$10-\$10-\$10. MAKE \$10 And more daily by supplying friends, neighbors and relatives with wonderful, new variety of Elmira all-occasion greeting cards, personalized stationery, imprinted napkins, gift wrappings and lovely gift bargains. Free catalog. Samples on approval. Bonus. Fast service. Ideal for church and club funds too. Write today. Elmira Greeting Card Co., Elmira 27, N. Y.

SELL Harmar's French fried popcorn to stores and taverns. Fast repeater. Harmar Products Co., Hammondsport, N. Y.

ABSOLUTELY Free—Sales kit. Sell personal initialed buckles with belts, cap badges, tie clasps, etc. Choose from 3000 emblems. Hook-Fast, Box 1425PM, Providence, R. I.

\$200 WEEKLY. New invention. Amazing 4-second Presto emergency tire chains, fit all modern auto wheels. National advertising building big demand. 3 sales daily to oil stations, dealers, etc., make \$200 or more weekly. Territory going fast. Write Presto Chain Co., Dept. P-16, Des Moines 2, Iowa.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12½c, ladies' coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

SCHOOL Seniors—Earn sensational profits selling classmates America's most beautiful graduation name cards. Largest selection. Outlets all others. Free sample kit. Printercraft, Dept. M, 1509 Maple St., Scranton 5, Penna.

AGENTS—300% Profit selling genuine gold window letters, stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

GOLD Lacquered and silver sign letters. Windows, doors, trucks. Standard sizes. Penny and up samples. Atlas-P, 544 West 79th, Chicago 26.

MEXICAN Feather pictures. High profit! Fast sellers! Adelphi, Box 57-B, Bellicose 6, N. Y.

\$50 WEEKLY Selling finest razor blades, other items. Free details. Edisons, Box 274, Far Rockaway, N. Y.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

SALESMEN, Distributors, fast selling costume jewelry direct from factory. Big picture catalog, free. Pickcraft, M10 Bank, Attleboro, Massachusetts.

MEXICAN Feather pictures. Sell on sight; 200% profit! Free details. Sample 20c stamps. (No coins.) Sylvian, Apartado 9036, Mexico City.

PRINTING, Salesbooks, envelopes. Free illustrated catalog. Ersko, Dept. PM, Bronx 72, New York.

BE A money maker. Use your home as magazine headquarters. Liberal commissions. No experience. No capital needed. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

BOYS Or girls, men or women: Earn large cash commissions, or valuable merchandise selling Garden Spot seeds. Send no money, just name and address, receive 50 packets of seed to sell at 10c packet, and free 24 page catalog. Lancaster County Seed Company, Dept. 412, Paradise, Penna.

ABSOLUTELY Free, yours for the asking. Send postcard today requesting free sales kit showing complete new line, belt buckles with your name or personal initials, cap badges, 3000 different emblems also uniforms, caps, shirts, ties, wallets, etc. Write Hook-Fast Company, Box 480PM, Roanoke, Virginia.

BIG Profits selling ties (\$2.00 values), \$8.50 dozen. Free catalog. Empire Cravats, 648 Broadway, New York 12.

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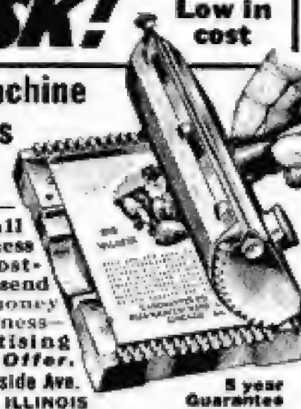
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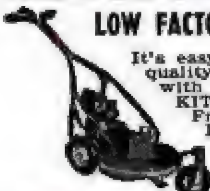
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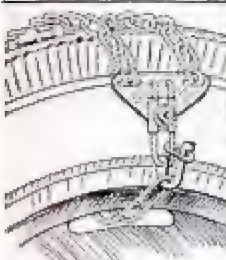
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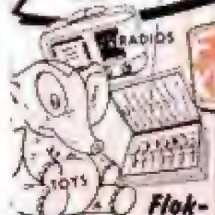
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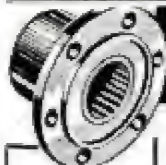


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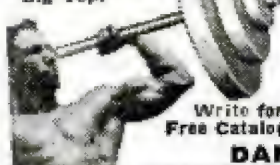
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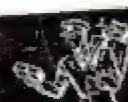
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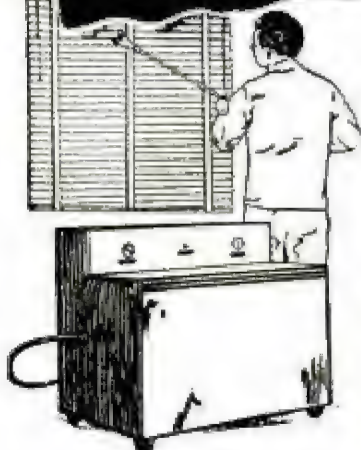
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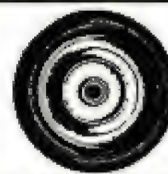
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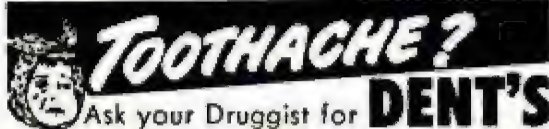


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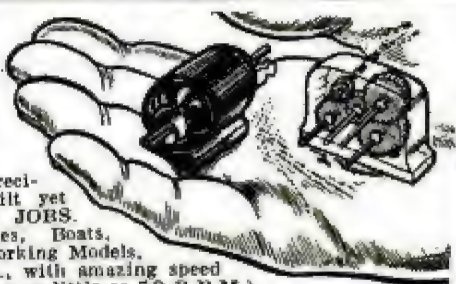
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SEE PAGE 21

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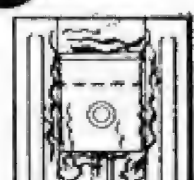
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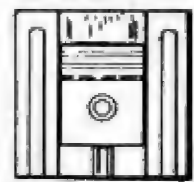
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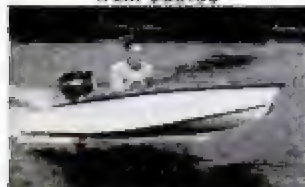
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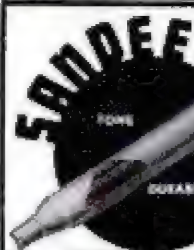
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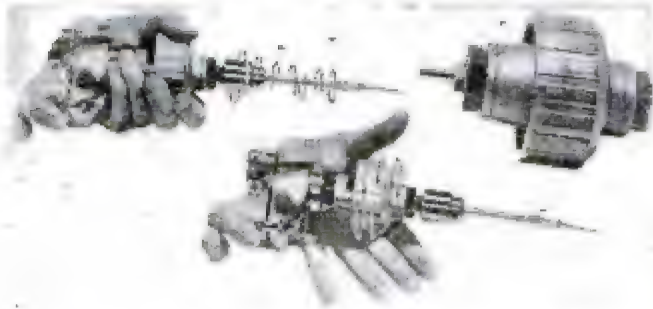
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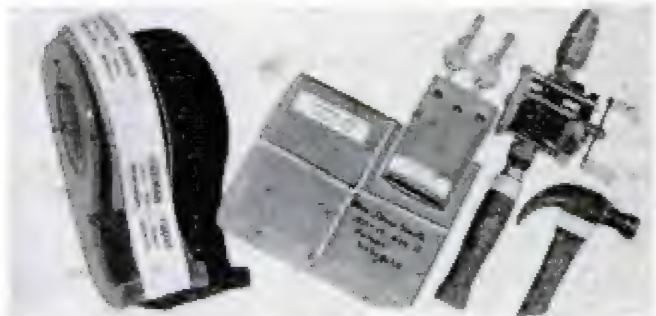
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THERE'S ONE American soldier home from Korea who can thank 75 blood donors for the fact that he's alive today. That's how many pints were transfused into him after he stepped on a land mine. All the surgery in the world couldn't have saved him if it hadn't been for that blood. And untold thousands of other war wounded owe their lives to the prompt availability of whole blood or plasma.

On the civilian front, an upholstery worker accidentally swallowed a little cleaning fluid recently. No visible damage. But his kidneys quit working, and for three weeks uneliminated poisons coursed through his blood stream, threatening to kill him. By completely replacing his blood three times, with 50 pints of whole blood from as many donors, doctors pulled him through.

Endless cases like this are on the plus side of the national blood ledger. So are the 3,000,000 pints collected by the Red

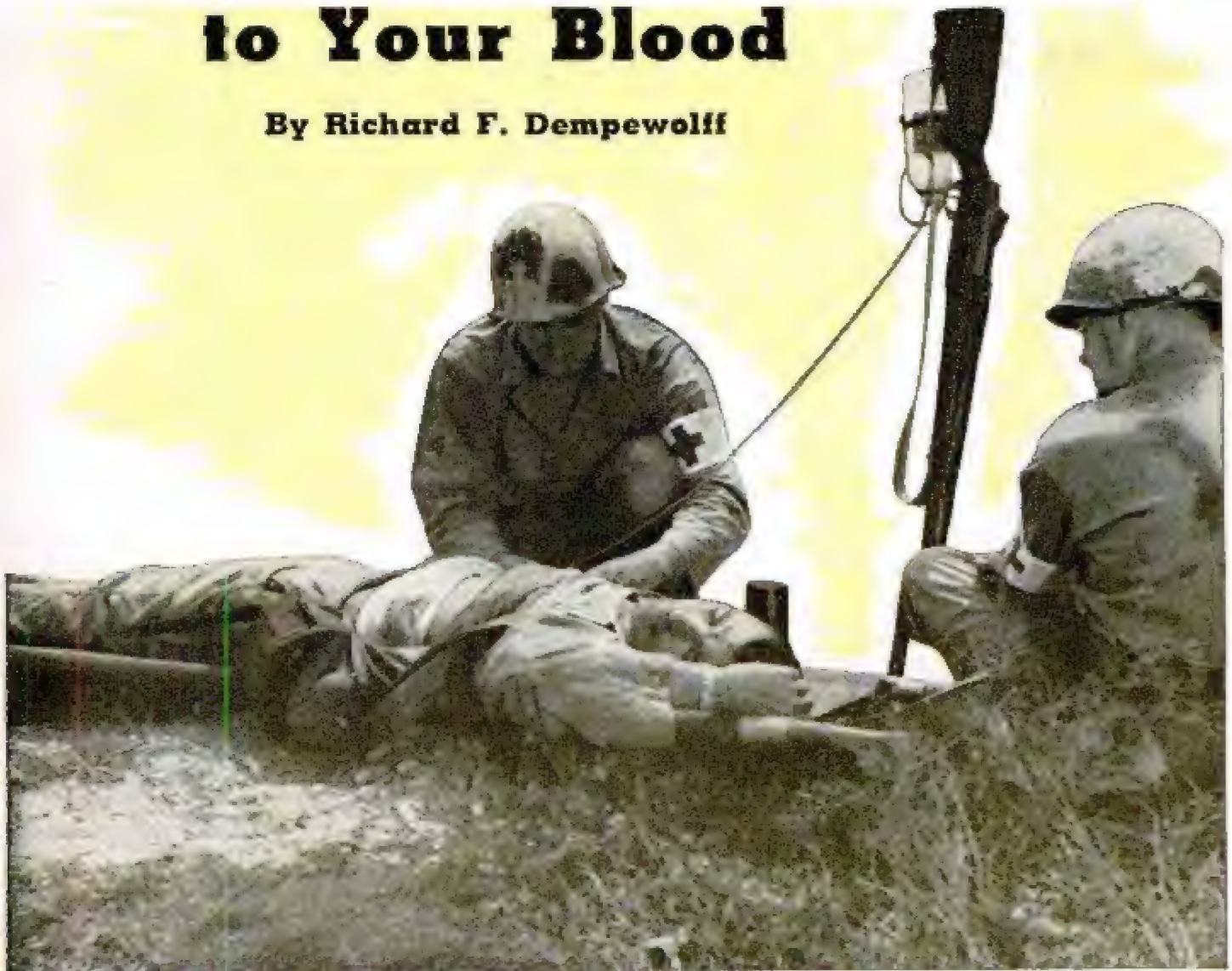
POPULAR FEBRUARY 1953 **MECHANICS**

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 99 NO. 2

Cross in the first four years of operating its new donor centers. That's enough blood to replace the normal body supply of 250,000 people. As fast as blood is collected today, it is shipped off to modern "assembly line" plants for sterile processing into liquid and dried plasma, or shock-cushioning serum albumin. Some is chilled, a preservative added, and packed off to war fronts or hospitals as "whole" blood in tricky sealed containers surrounded by chopped ice to keep it in a transfusable

Look What's Happening to Your Blood

By Richard F. Dempewolf



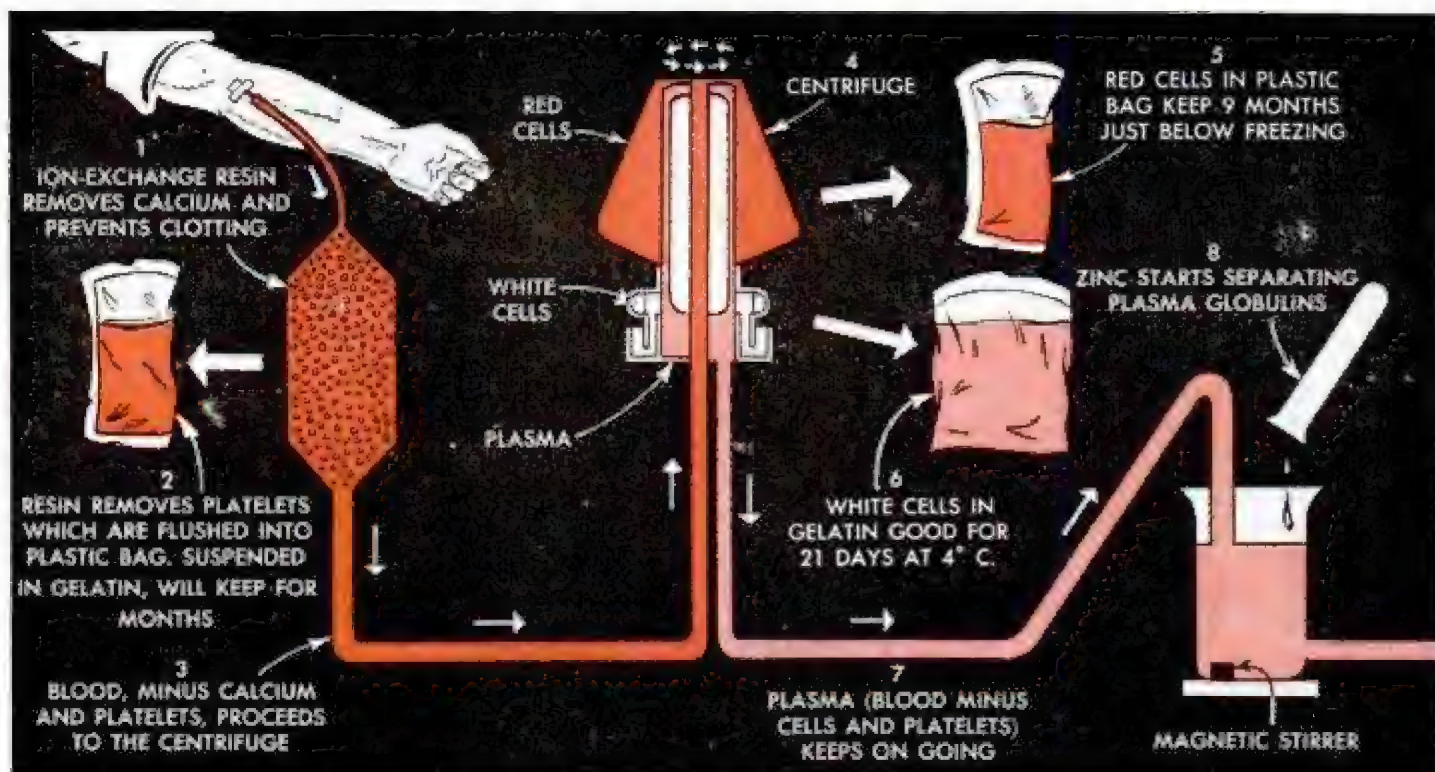


Diagram shows how Dr. Cohn's portable blood factory breaks down blood into parts for individual stockpiling

state for a period as long as three weeks.

But there's one big catch that has kept scientists burning midnight oil. If an atom bomb should ever be used—even an “old fashioned” one such as was dropped on Hiroshima or Nagasaki—adequate transfusions for the injured will require more than the 10,300,000 pints that filled the entire needs of World War II! And it will have to be produced instantly. How could we produce it? Build up a stockpile? Up to now it has been impossible to store blood for safe transfusion beyond 21 days.

Plasma can be freeze-dried and kept for five years. But plasma can't do the job in an injured body that whole blood can do. When you know the nature of the blood coursing through your body, you can understand why. Actually, it is a river of colorless fluid, so full of floating objects that it appears to be a thick, red homogeneous liquid. Millions of red cells that carry oxygen to body tissue and trade it for carbon dioxide, which they tote back to the lungs for removal, give it its color. But they're not alone in the river. There are more millions of white cells—shapeless, flowing fellows that attack and absorb bacterial infection. Platelets—tiny disk-like things that help trigger off the mysterious clotting process—crowd around other elements. Globulins, which contain antibodies that fight virus infections (like measles), and scores of other plasma proteins, all help to make the river traffic pretty heavy. Any or all of these elements may be a vital factor in aiding a hurt man to recover from his injuries.

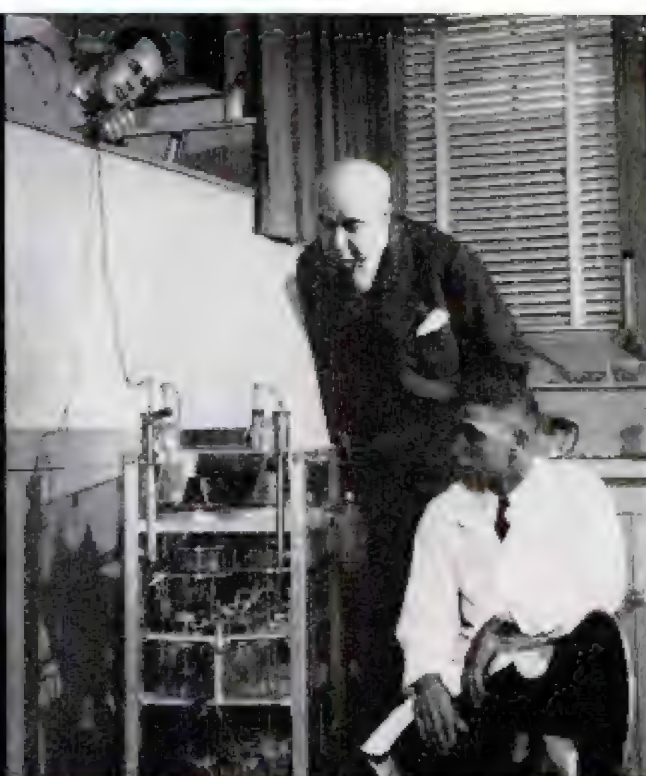
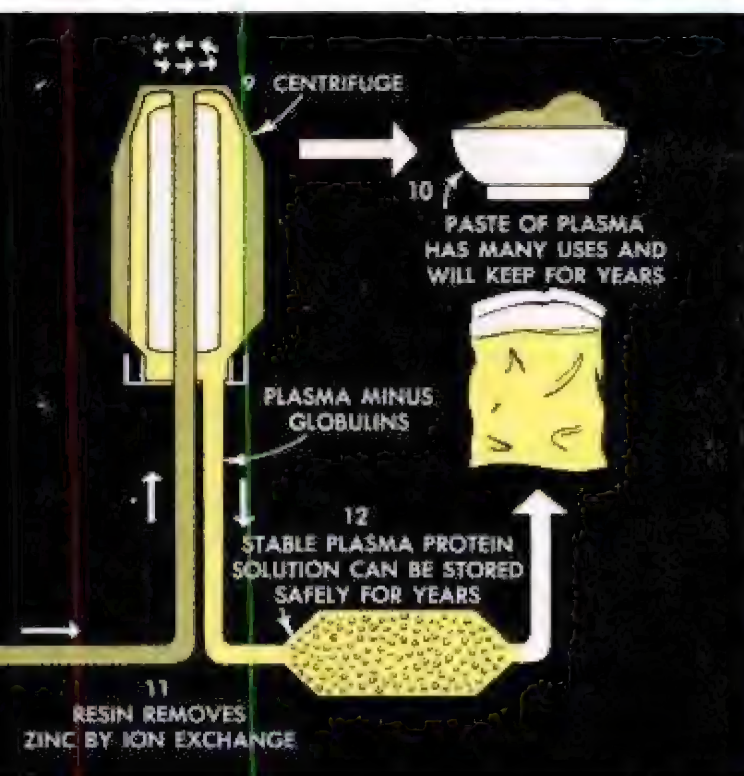
Plasma has only some of them. It is the

amber fluid that remains after the cells and some other elements have been removed from the blood. It has other disadvantages. Unless irradiated it can transmit jaundice. Freezing doesn't kill the miserable jaundice virus. If irradiated, even more good is destroyed by the ultraviolet rays. But for shock treatment and maintaining blood volume, plasma is valuable.

“In World War II, plasma was used with great success,” explains Dr. Francis Blake, chairman of the military's committee on medical sciences. “However, plasma alone is not sufficient in injuries from ionizing radiation (which temporarily restrains production of vital blood elements in the bone marrow). Whole blood must be given until a person's bone marrow has a chance to recover.” Experts figure that 55 percent of atomic casualties would be burn cases, 15 percent would suffer radiation effects. One bad burn case alone, they know, can require 40 pints of whole blood and 36 pints of plasma!

So, if a major catastrophe should occur, even a Niagara of blood donations would not do the job. It couldn't be handled fast enough with present bulky equipment. It would be a bleak picture indeed—except for one thing. In laboratories and shops all over the country, blood scientists and engineers are working on scores of new ideas and machinery. Not only may we soon be stockpiling the perishable substance, but we may be seeing blood used for things no layman ever thought possible.

In a Cambridge, Mass., laboratory with the thundering title of “Blood Characterization and Preservation Laboratory for

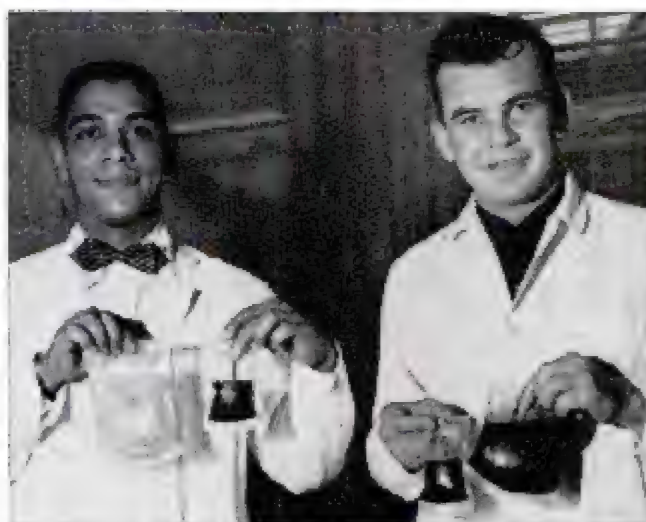


Dr. E. J. Cohn (center) watches his compact blood factory as it separates blood into preservable parts

Research and Development for the National Blood Program at Bussey Institution of Applied Biology, Harvard University," a whole new approach to "blood banking" is under way. Here, Dr. Edwin J. Cohn, distinguished protein chemist, is busy leading a revolution in the blood business.

In the cellar of one of Cohn's labs sits a complete glass-enclosed blood-processing factory on wheels—about the size of a small electric dishwasher. In one operation, this fabulous 120-pound machine can do everything—and more—now accomplished in a big donor depot and acres of processing plant. Four donors lie down beside it at once. Blood from each feeds into the Goldbergerian contraption through plastic tubing at one end. Out the other end comes a wide assortment of "fractions," or "parts" of blood. No bottles are involved. Automatically separated red cells, white cells, platelets and plasma fractions drop into separate sterile plastic bags, packaged and ready for further processing or immediate use before the donor has finished his cookie and milk.

The work is all done in a continuous cycle—at the rate the blood flows from the donor's arm. Four small, spinning glass centrifuges whirl dizzily on the top shelf of the machine under the watchful eye of young Bob Tinch who is responsible for many of the technical wrinkles that make Doctor Cohn's apparatus work better. The blood, he explains, enters the machine through a sack of resin beads which, by ion exchange, remove the calcium. Without this the blood no longer clots. (Current systems use a chemical that changes some



Machine separates blood products into sterile plastic bags containing (left to right) stable plasma-protein solution, platelets, red cells, white cells. Below, laboratory makes a synthetic blood extender

Schenley Laboratories, Inc. photos





Here are steps in handling Red Cross donors' blood. Above, refrigerated, it goes to processing center



First step at processing center is to separate red cells and other parts from plasma in centrifuges



Plasma is drawn off by vacuum from individual donor bottles and is fed into large "pools" or tanks



Plasma from tanks is shot in a thin film through ultraviolet tubes in order to kill jaundice virus

characteristics of natural blood. The resin doesn't.) For some mysterious reason, platelets also stay in the resin sack, from which they later are flushed out into a sterile plastic bag. The red stream proceeds through a heat exchanger that chills it, and on into a centrifuge. Here, red cells are spun out farthest (due to their weight) and drop into a plastic bag. White cells catch in a little bulge at the base of the spinning globe and will drop into their bag when the machine stops. The remaining plasma moves on through more centrifuging and chemical treatments that break it down into a paste containing virus-fighting globulins and clotting elements, and an amber fluid called "stable plasma protein solution," or SPPS. Doctor Cohn envisions scores of the portable machines eventually wheeling to the corners of the country, gathering and processing blood as they go. "Allowing half an hour for the cycle of the new collecting unit," he points out, "1000 of the machines could process 3,000,000 donations a year."

What's the idea of tearing the blood to pieces? Dr. Douglas Surgenor, one of the lab's specialists, explains the Cohn idea simply: "There are more than 30 known parts of blood," he says. "Together, they make whole blood, which is hard to preserve because of chemical action. But by pulling blood apart piece by piece, it may be possible to preserve each component separately for a much longer period of time. One may keep if frozen, another if dried, and so on. Theoretically, if you could preserve them separately, and put them all together when you needed them again, you'd have whole blood."

Even more important is Doctor Cohn's hope for real blood economy. Instead of transfusing whole blood into every sick person, the day may come when a patient will get just the blood fraction needed for the job—shock victims might get albumin and red cells; anemics might need only red cells; heavy bleeding could be stopped with fibrinogen plus other protein elements in the right amount to form clotting. The pa-



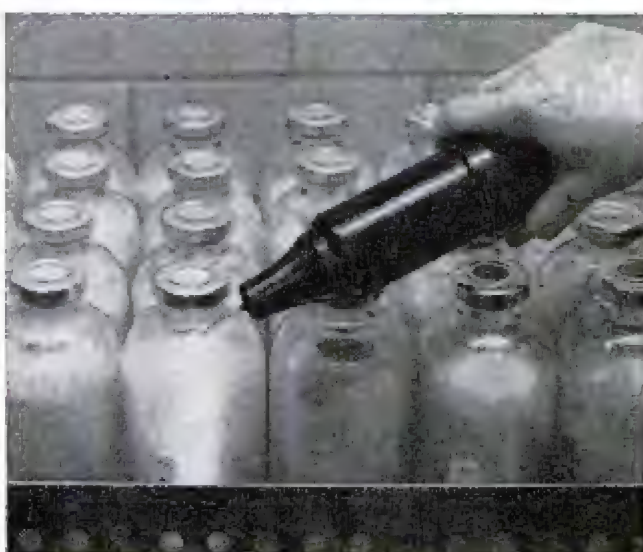
After ultraviolet-ray bath, the irradiated plasma is fed into its final container under high pressure



Bottles of plasma are rotated in an alcohol bath, chilling them to -80° F. This facilitates the drying



Trays of frozen plasma are rolled into a high-vacuum oven where the fluid is reduced to a dry powder



Dried plasma sealed under vacuum is tested for any leaks with spark producer. Purple glow means okay

tient might also get doses of SPPS, so valuable in extending the depleting blood in his system, and so on.

Already, in the labyrinth of cold rooms and bustling labs of Doctor Cohn's kingdom, scores of his colleagues are racing against time to help prove the boss' theory.

In Dr. John Gibson's special domain of red cells—useful in medical wards for anemia, and associated with wound infections—these separate inhabitants of the blood stream have been plunged into a deep sleep in solution, just below freezing, and kept for considerably longer than 21 days. Dr. Max Strumia of Bryn Mawr, Pa., has done even better. More than nine months ago, he froze batches of red cells that are still good.

White cells are a special concern of Dr. James Tullis, who also digs into the private lives of platelets and red cells. The bacteria-fighting white cells posed a real problem, though. Their natural life span in blood is only one to three days. They are the fellows whose manufacture is stopped

by atomic radiation. Hence, those alive in a radiation victim's blood stream will die before new ones start coming off the bone-marrow production lines again. That's why a transfusion of white cells would be a vital factor in saving the lives of bomb victims. But how can you keep a living stockpile of something that normally dies in three days? To make it tougher, white cells are fragile and active. Bunch them up and they crush.

Doctor Tullis got his answer while eating fresh peaches in Jello at lunch one day. Could a man suspend white cells in gelatin—like peaches in Jello—he wondered? That way they'd be held apart. Besides, gelatin can be injected without harmful effects, so that the jellied white cells would be all ready for use—if it worked.

It did! By keeping the gelatinized white cells at four degrees centigrade, Doctor Tullis has managed to preserve them for three whole weeks—18 days beyond their natural life span.

The gelatin idea is also working with



New pump speeds blood or plasma into body at rate of one pint in a minute and a half in an emergency

Blood scientist works in "ice box" laboratory at sub-zero temperature separating unstable blood parts



platelets which formerly were too delicate to store any length of time. Besides suspending them safely, the gelatin helps preserve them. Now they keep for months. One sick woman was kept alive for seven weeks by injections of preserved platelets.

And so it goes. One at a time, the various parts of human blood are getting the business at Harvard. Fibrinogen—the substance which becomes fibers that make up a blood clot—is being prepared in new ways. After eight years of storage the properties of fibrinogen are still good. Thrombin—another clotting component—is being separately dried in powder form. During the war, if a doctor wanted quick healing of a large gap in human tissue, he could lay a preparation of spongelike "fibrin foam" over the area, add thromboplastin and a big clot automatically formed—more neatly than if a man's own blood did the job. The only difference was that the scab tissue was white due to the absence of red cells. Such clinical work recently has been abandoned for the time being, but may prove important in the future.

Experiments in separation and preservation of scores of blood proteins are still under way at Harvard. Gamma globulin, a blood protein containing antibodies that fight viruses, already is being preserved and used to prevent measles. The recent mass-injection tests in Texas you've read about have shown that gamma globulin works against virus enemy No. 1—polio.

Gamma globulin is in plasma. Formerly, when preserved in plasma, it stayed good one year. Now, as a separated fraction, it has been kept, unrefrigerated, for six years, and experts think it may last 11 or 12. But it's precious stuff. One pint of blood yields only two grams of it, and the blood must come from someone who has just recovered from an attack of the specific virus infection the doctors are after.

Harvard is not the only place where things are happening in the blood business. In hospitals all over the country, experts are working on new devices and systems. It may not be long before one drop of a patient's blood is enough to make a complete analysis of it in a few minutes. The tiny drop will pop through a millrace of machines and chemicals. Spectrophotometers will measure color changes, dyes will determine chemical reactions, flame photometers will measure the colors the blood makes in a flame and tell some of the things that are in it. Scores of other new instruments will take a peek at the sample and give a verdict. One new machine called a Hewson clinatron can test 4300 blood specimens for sugar in 40 hours—a job that last year took 15 weeks of a technician's time.

(Continued to page 288)

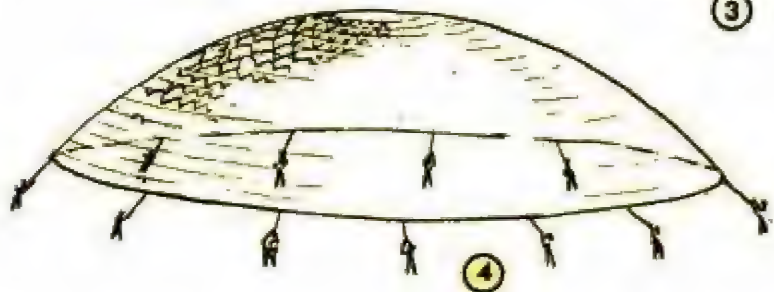
Floating Plastic Dome Could Cover Stadium

PLASTIC WINDOWS filled with helium and joined to make a floating umbrellalike dome may cover stadiums and baseball parks of the future. This idea is advanced by Prof. Ambrose M. Richardson, University of Illinois architect. He believes it may be possible, eventually, to cover entire cities with the industrial buildings outside of the dome. Richardson is now at work on a one-acre trial model that will cost about \$25,000. He estimates it would cost \$200,000 for a stadium canopy. The dome would be anchored by cables with no interior support except buoyant helium to hold the pillows aloft with edges of the dome 10 feet off the ground. Richardson envisions homes under the dome built without roofs and with lightweight walls for privacy. Even on overcast days, he predicts, solar radiation would provide adequate heat. Supplementary radiant heat could be arranged for cool evenings. Richardson claims this type of dome is easy to repair.

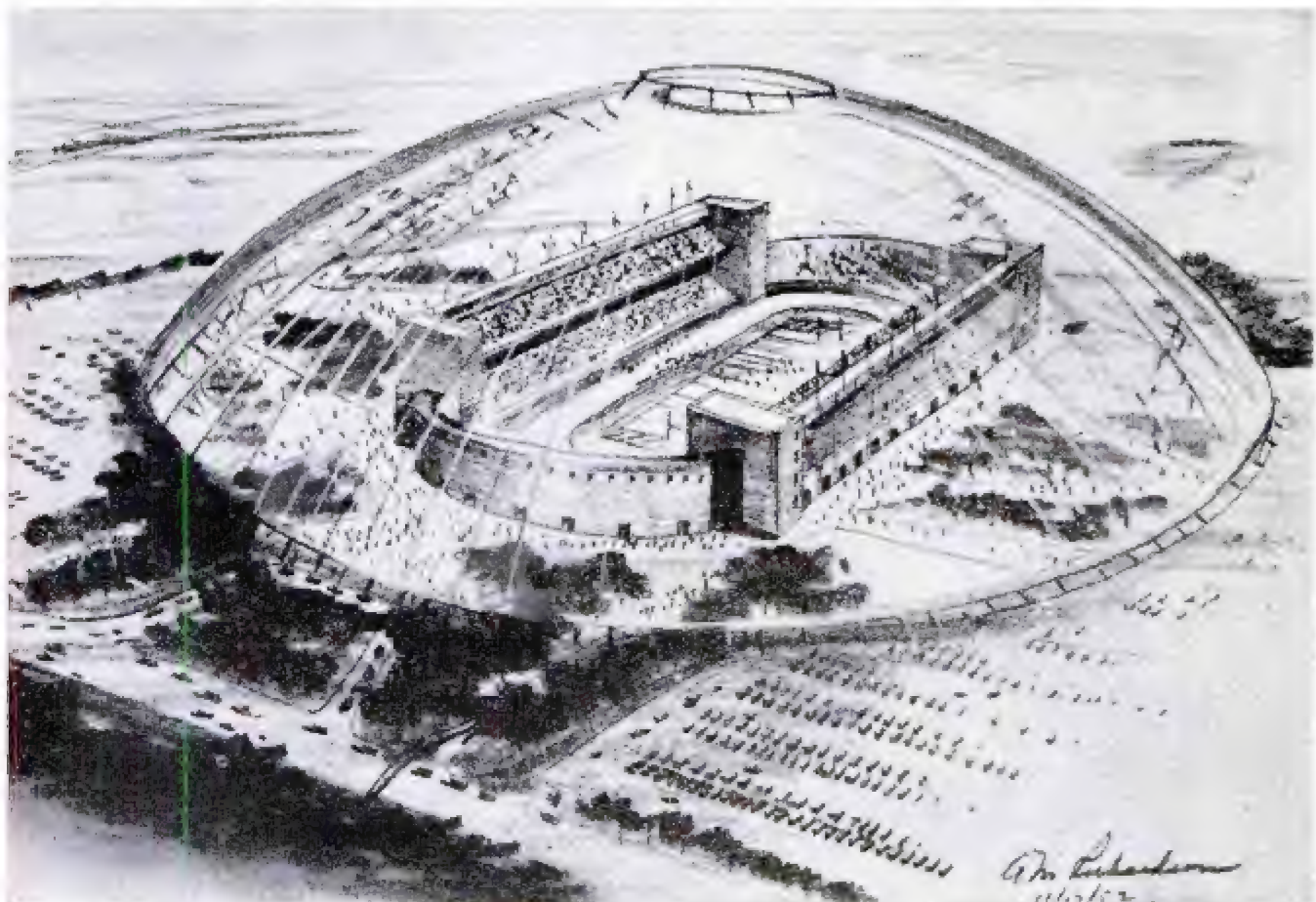
Figs. 1 and 2 show preliminary operations for assembling pillows for the dome

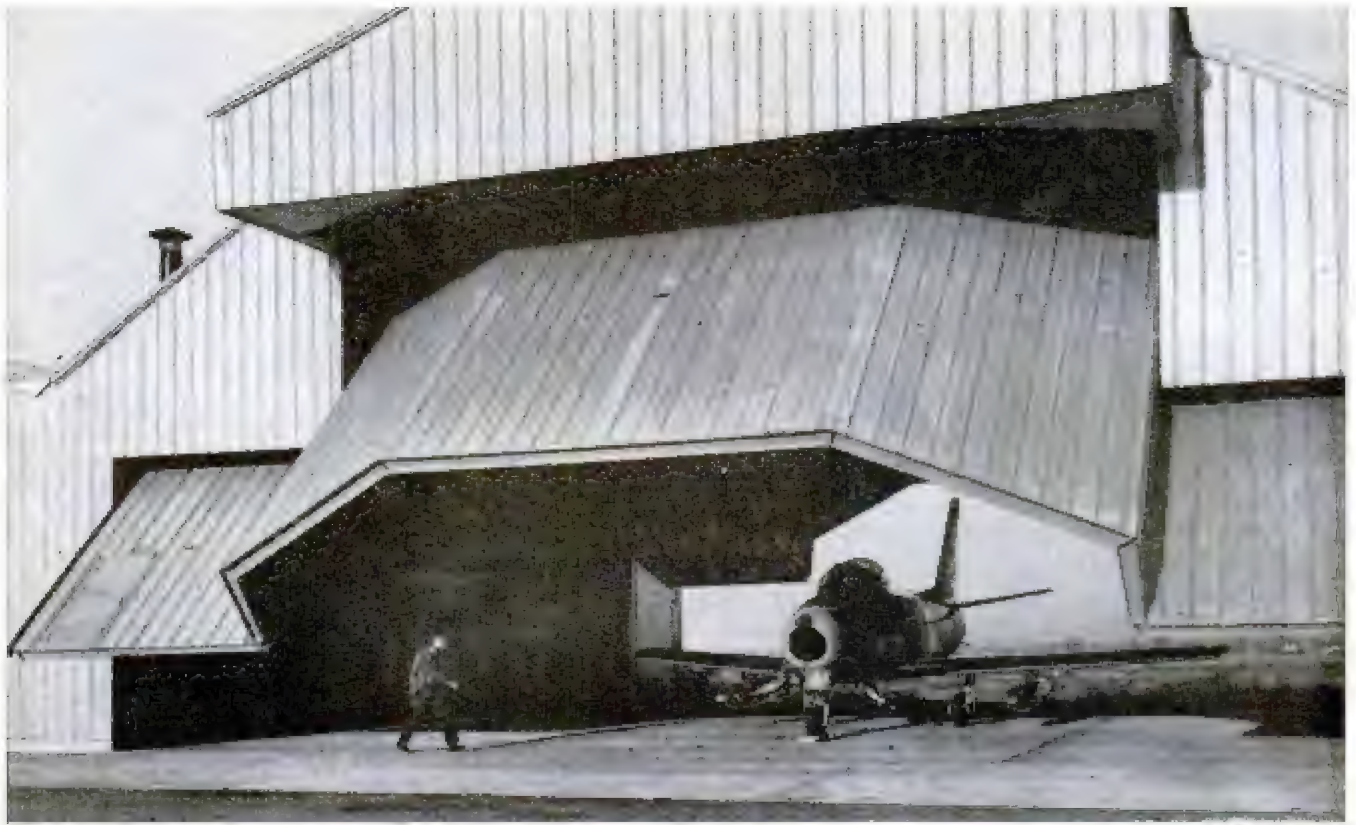


Before inflation starts (Fig. 3) dome of pillows is drawn together for easy handling. Weights hang below



Dome of plastic pillows has air vent at top covered by a second canopy. Cool air enters at top and flows down to force warm air out the edges which would be 10 or 12 feet from the ground. Dome of this type could cover a big stadium or ball park for \$200,000





U. S. Air Force photo

Alert-Hangar Doors Yawn Open in 30 Seconds

In less than 30 seconds both the front and back doors of the Air Force's new alert hangars yawn open and allow aircraft to be on their way. Fighters can be airborne within three minutes after the initial warning. Previously, fighter-interceptors have been parked in the open while "on the alert" and the pilots often had to run long distances to their aircraft. The new arrange-

ment can be likened to a firehouse, with the pilots sleeping upstairs, a few feet from their aircraft, ready to scramble when the siren sounds. Each all-metal hangar has four bays, capable of housing two aircraft apiece, and is located at the end of the runway that has the prevailing wind so that planes can emerge and take off almost immediately.

German Bobsled Utilizes Short Skis as Runners

Able to coast down any slope that will take a sled or a skier, a German bobsled ends the need for a special iced run such as needed for the ordinary bobsled. Seven short skis replace the conventional runners; sharp turns are negotiated in much the same way a skier makes a turn. The product

of a decade of research by Munich inventor Rudolf Reitmeier, it was recently tested by Germany's champion bobsled team. The new sled can be assembled by two persons.

❏ Fireplace logs of wood by-products are sold by vending machines in Seattle.





Sailing ashore, a "barc" can discharge a 35-ton tank and a 35-ton crane in the same load. The Army's newest amphibious vehicle is 27½ feet wide, 61 feet long and 16 feet high. With fuel, it weighs 197,000 pounds

Amphib Lands Big Tank Ready for Combat

EQUIPMENT AS LARGE as a railroad locomotive can be moved by the Army's newest amphibious carrier, a 60-ton vehicle powered by four 165-horsepower diesel engines. It is 61 feet long, 27½ feet wide and 16 feet high. On land, the vehicle, called a "barc," a contraction of barge and cargo, rolls along on 10-foot, rubber-tired wheels and in water it relies on twin-screw propellers. Each wheel is driven by a separate engine and two engines drive each propeller when the craft is waterborne. The amphibian has a specially designed landing-craft type of ramp which permits a loaded 35-ton tank to leave the vehicle under its own power and ready for combat.



Pressure in the huge tires can be varied from within the cab to meet changing ground-surface conditions

With a top water speed of seven miles an hour, the vehicle handles almost as easily as a small landing craft





Above, Clymer when he set two world records back in 1916. Left, he can still do some tricks! That's a 1953 Triumph



Floyd Clymer Reports on Motorcycles

Veteran racer and a former world-record holder, Clymer is well qualified to survey the 1953 motorcycle field for our readers

BACK IN 1916, I tore around the two-mile dirt speedway at Dodge City, Kans., to set two world's records—100 miles in 71 minutes and 45 seconds and 83 miles in 60 minutes. My bike was a 61-cubic-inch dual-valve Harley-Davidson twin without transmission or clutch.

Last year Bobby Hill, riding a British Norton, averaged about 83 miles an hour for 200 miles in the revival of the famed Dodge City event. Not much improvement, you say? Well, I haven't mentioned the most amazing part of the story: The Norton had only half the displacement of my old Harley. And, what is more, it had a transmission and clutch.

That comparison just about summarizes the story of the motorcycle during the past 37 years. It's a story of greater efficiency from smaller engines—of squeezing more

power from more compact designs. Virtually all makes of competition bikes today are outperforming motorcycles made before the '30s with twice the displacement.

This and other facts explain the return to popularity of the powered bicycle—a vehicle on which sales had slumped badly in the early '30s after a tremendous success story that began in 1901 when bicycle dealer George M. Hendee had Oscar Hedstrom make his first motorbike, forerunner of today's Indian.

Two years later in Milwaukee, Wis., three brothers, William, Walter and Arthur Davidson and William S. Harley, a quartet of machinists and patternmakers, decided to get into the motorcycle field and produced the first experimental Harley-Davidson. In 1907 the Harley-Davidson Motor Co. was organized and by 1917 it was the



Public interest in motorcycle racing has increased considerably. This is a Harley-Davidson leading the pack

largest manufacturer of motorcycles in the United States.

But these were not the only two motorcycle manufacturers. The country was dotted with companies. In 1911 more than 100 makes already had been manufactured. A few of the makes, some short-lived, included Yale-California, Marsh-Metz, Columbia, Thor, Curtiss, Marvel, Wagner, Merkel, A-M-C, Thomas Auto-Bi, Orient, Emblem, Excelsior, Geer, Pirate, Apache, Thiem, Pope, Armac, Pierce, Reading-Standard, Iver-Johnson, Holly, Cleveland, Henderson, Minneapolis, New Era, Shaw, Dayton and many others, including a steam motorcycle built by John Barr of Middletown, Ohio. Even the mail-order houses like Sears Roebuck and Montgomery Ward were selling motorcycles bearing their own names.

Before the '20s, motorcycle popularity was at a high peak in this country. There is something about motorcycling that gets into your blood. It has a fascination that a nonrider cannot understand. Most motorcyclists would rather ride a bike than drive the finest automobile available. This fascination is sometimes explained as a consequence of the transition from the horse to the automobile. Some men still hanker to feel a good animal between their legs and yet they are forced to admit that this is a machine age. So they turn to the motorcycle as a compromise. It is ridden like a horse. The rider becomes a part of the

machine's movements and responds much the same as a good horseman.

Whatever the reason, the motorcycle was doing fine at the end of World War I. Then, a sales decline began and during the depression years the American motorcycle industry consisted only of two large manufacturers, Harley-Davidson and Indian. The Excelsior and Henderson "Four" which had been manufactured for several years by Ignatz Schwinn had been discontinued. (Schwinn was the founder of the bicycle firm that has since become the

Hill climbing is a supreme test of riding ability and power. It has always been a popular form of competition with the motorcycle riders

Harley-Davidson photo





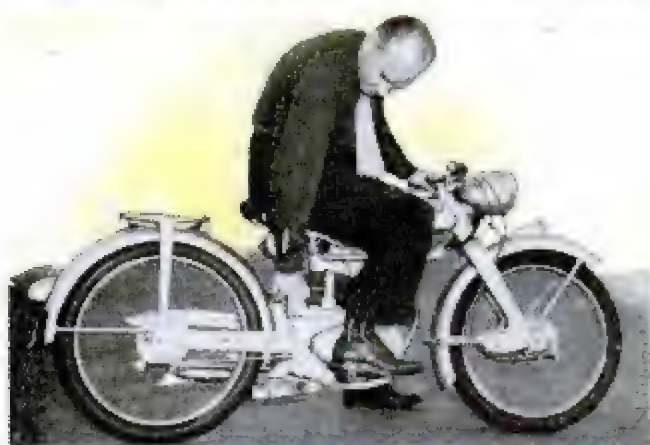
Italy's best-known motorcycle in this country is the Guzzi. It has a horizontal 500-cubic-centimeter engine



One of world's fastest is the 61-cubic-inch British Vincent. It has no frame below and ahead of engine



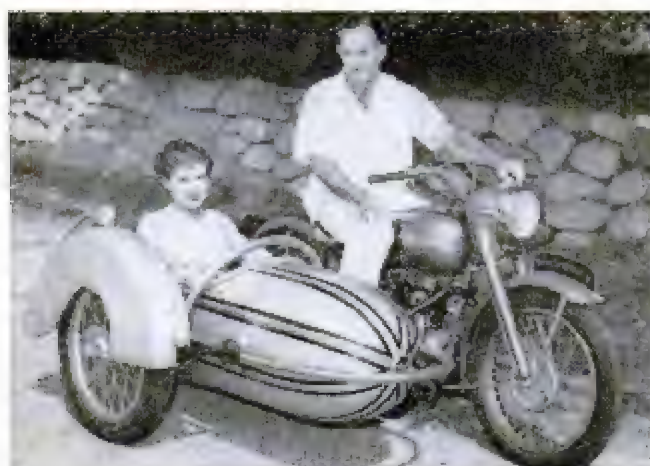
Above, the Ariel Square 4 has a smooth, even flow of power that makes it a fascinating bike to ride

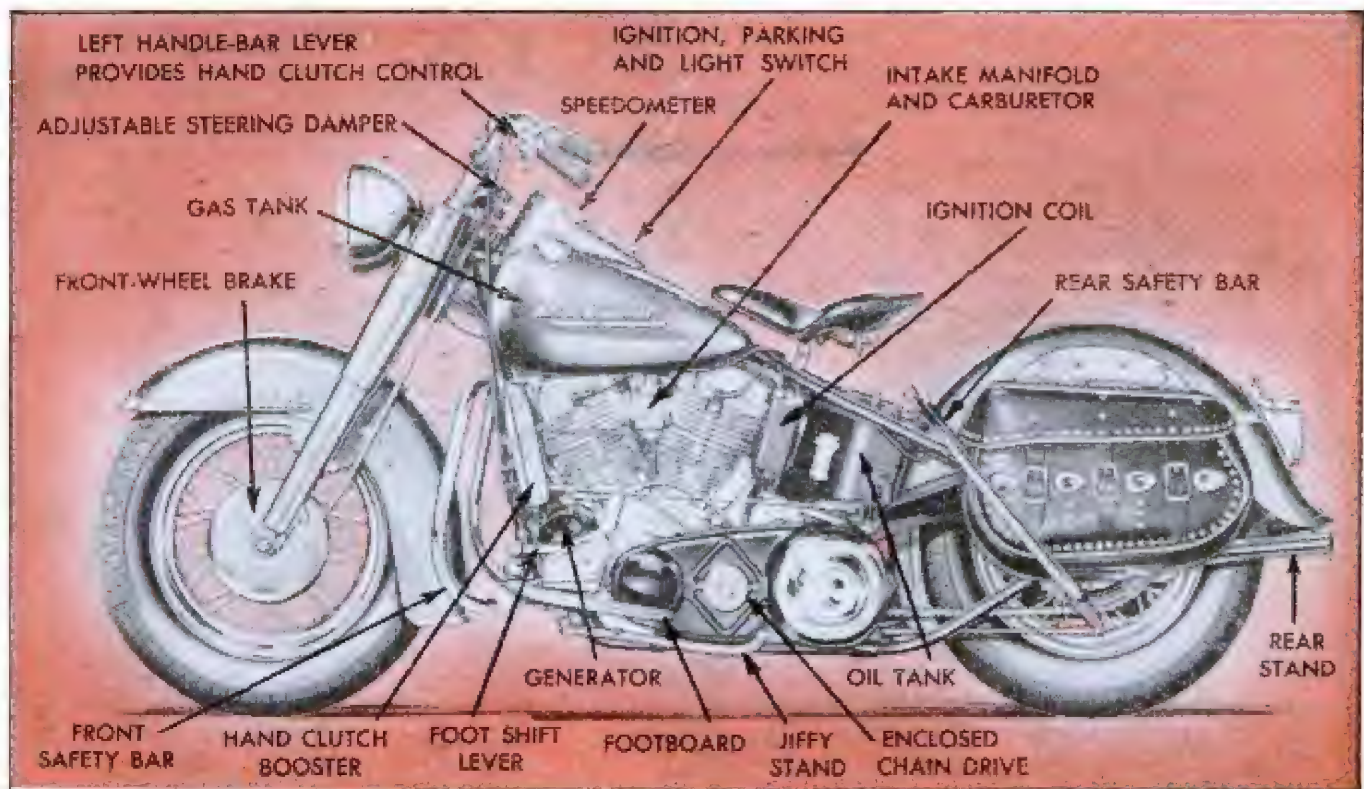


German makes are becoming more popular here. The new NSU Fox four-stroke single is shown above. Rider adjusts the ride control. Below, also German, is the Steib sidecar. The bike is a Triumph Thunderbird



Above, a newcomer in the domestic ranks is the Mustang single. Below, two British BSA models. The 125-cubic-centimeter Bantam is at left. The 650-cubic-centimeter Golden Flash, right, has upswept exhaust





Labels point out the important features on left side of a 1953 Harley-Davidson Big Twin 74-cubic-inch model

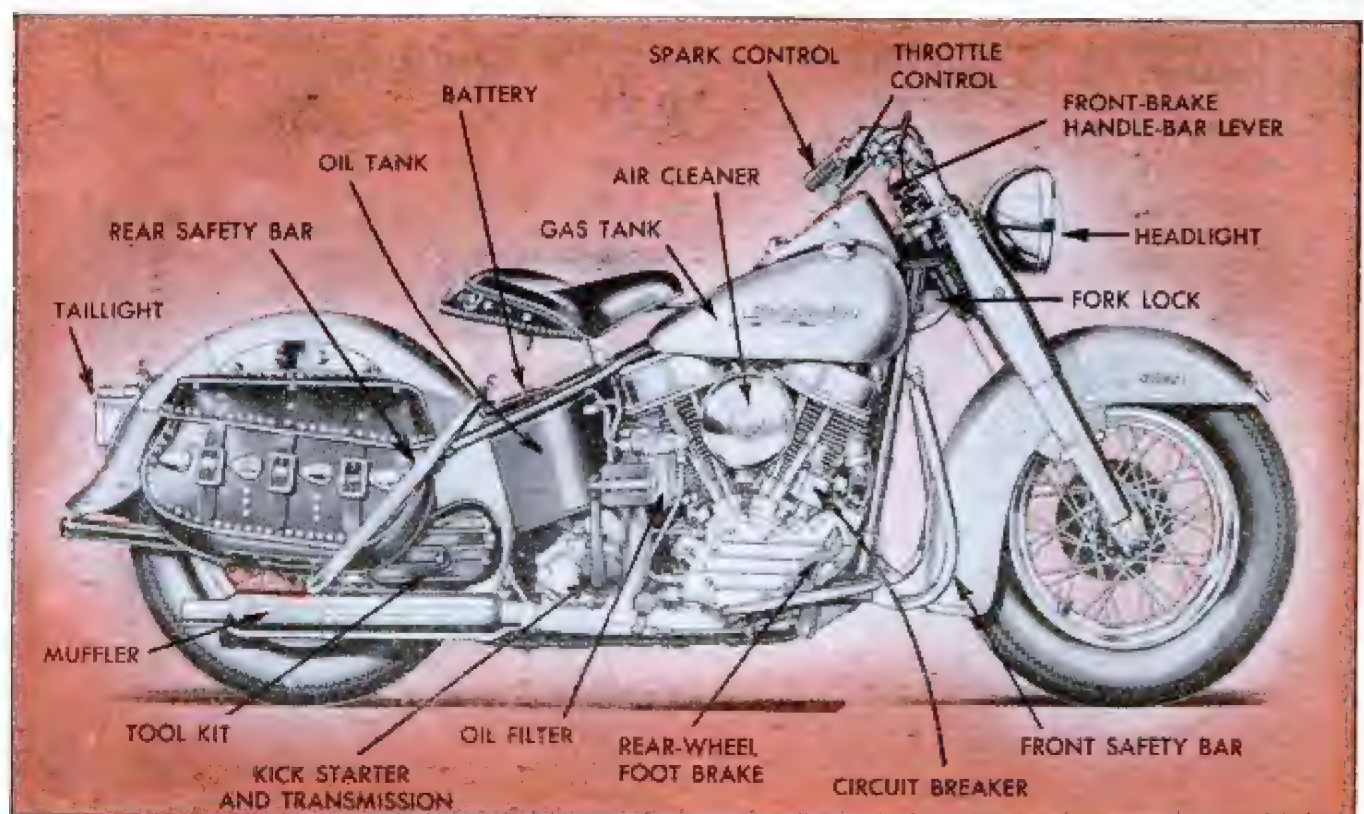
largest in the United States.) Sales of all makes dropped to a few thousand a year with Harley-Davidson having about 70 percent of the total and Indian 30 percent.

Just before World War II, a few hundred British motorcycles were imported and were undoubtedly responsible for a renewed interest in motorcycling in the United States. Soon after the war new dealers handling many British makes sprang up in cities and towns throughout the

country. As a result, thousands of young men were converted into motorcycle enthusiasts. Today enthusiasm and sales are at an all-time high in this country.

Harley-Davidson is still by far the largest manufacturer of American motorcycles and while the Indian Co. of Springfield, Mass., is building Indians it also is United States distributor for several makes of British motorcycles, including Norton, Matchless, AJS, Excelsior, Royal Enfield

Here are the right-side features. This bike is popular for sports as well as for sidecar, commercial and police use



Largest of the American motorcycles is the 1953 Indian 80 Big Twin. It has an 80-cubic-inch displacement. Note the skirted fenders, engine shield, chain guard and large seat



and Vincent. Thus many Indian dealers handle one or more foreign makes.

There are a few other makers of light-weight motorcycles or power bicycles in the United States, such as Servi-Cycle, Powell and Mustang. There also are many motor scooters produced, which tend to increase interest in the field by creating new riders who later buy larger and more powerful machines.

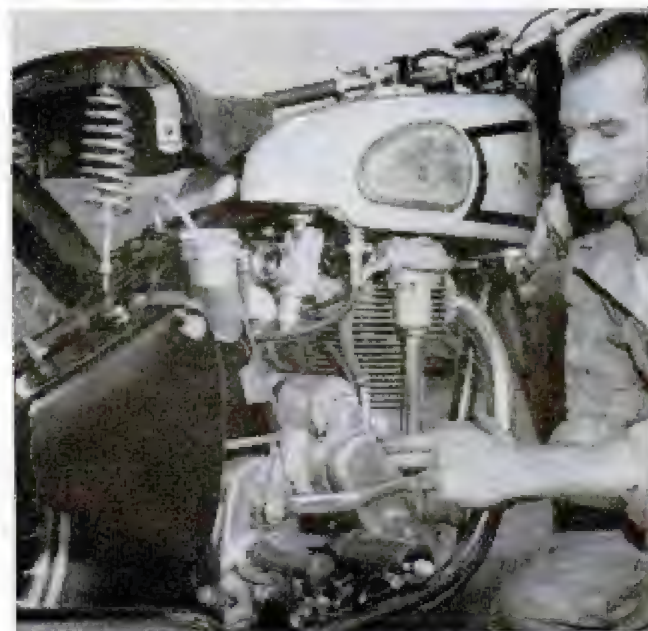
In addition to the large number of British makes on sale in this country there is a limited number imported from Germany, Italy, France, Austria, Czechoslovakia and

a handful from Switzerland, Belgium and Japan.

Unlike the horsepower race in the automobile field, competition among motorcycle engineers seems to aim at greater efficiency from smaller engines. With the exception of the new 80-cubic-inch twin Indian Chief, with the largest displacement of any motorcycle engine, the trend has been toward smaller engines. Harley-Davidson with its new Model K 45-cubic-inch twin has produced a machine that will outperform a great many 61, 74 and

(Continued to page 262)

Clymer points to the new large cylinder head on the popular British Velocette overhead-camshaft single

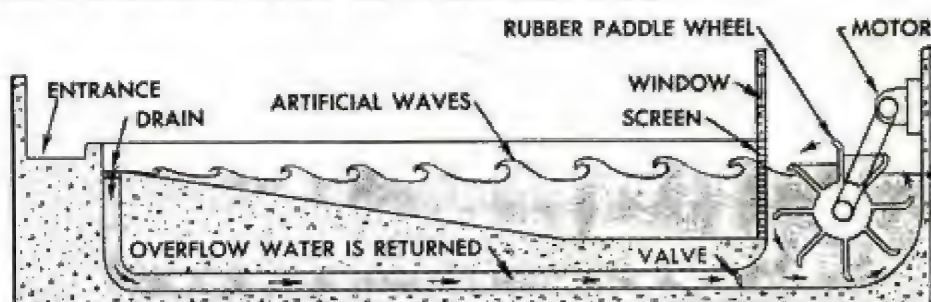


Winner of the world's outstanding racing events is the British Norton with its 30.50-cubic-inch engine



Paddle Wheel Creates Artificial Surf in German Pool

Huge waves roll out to greet swimmers entering an indoor pool at a German health resort on the North Sea. The waves, artificially created by a hidden paddle wheel at the deep end of the pool, surge across the surface of the water and break on a grated strand. As shown in the sectional drawing, the overflow is carried back under the pool to the wheel compartment where it is



again sent across the pool as waves. Loudspeakers, activated in an observation room, convey directions or music to bathers.

Radiophones Help Clear Canadian Winter Roads

Long-distance telephone operators in Ontario summon drivers of snow-moving equipment by sounding the horn or switching on lights in the vacant cabs. Two-way radiophones connect snowplows, maintenance trucks and the conventional-telephone system. When a driver does not answer the summons of a long-distance operator at once, she can automatically start the horn in the cab of the snowplow or

truck. If the driver is too far away to hear the horn and does not answer the radiophone, the operator remotely switches on a light in the cab, which tells the driver to call the operator when he gets back. The radiophones speed clearance of over 10,000 miles of road during heavy snowstorms, and supply emergency communications to summon doctors and ambulances to the aid of victims of accidents.

Grain Combine Dries As It Harvests Crop

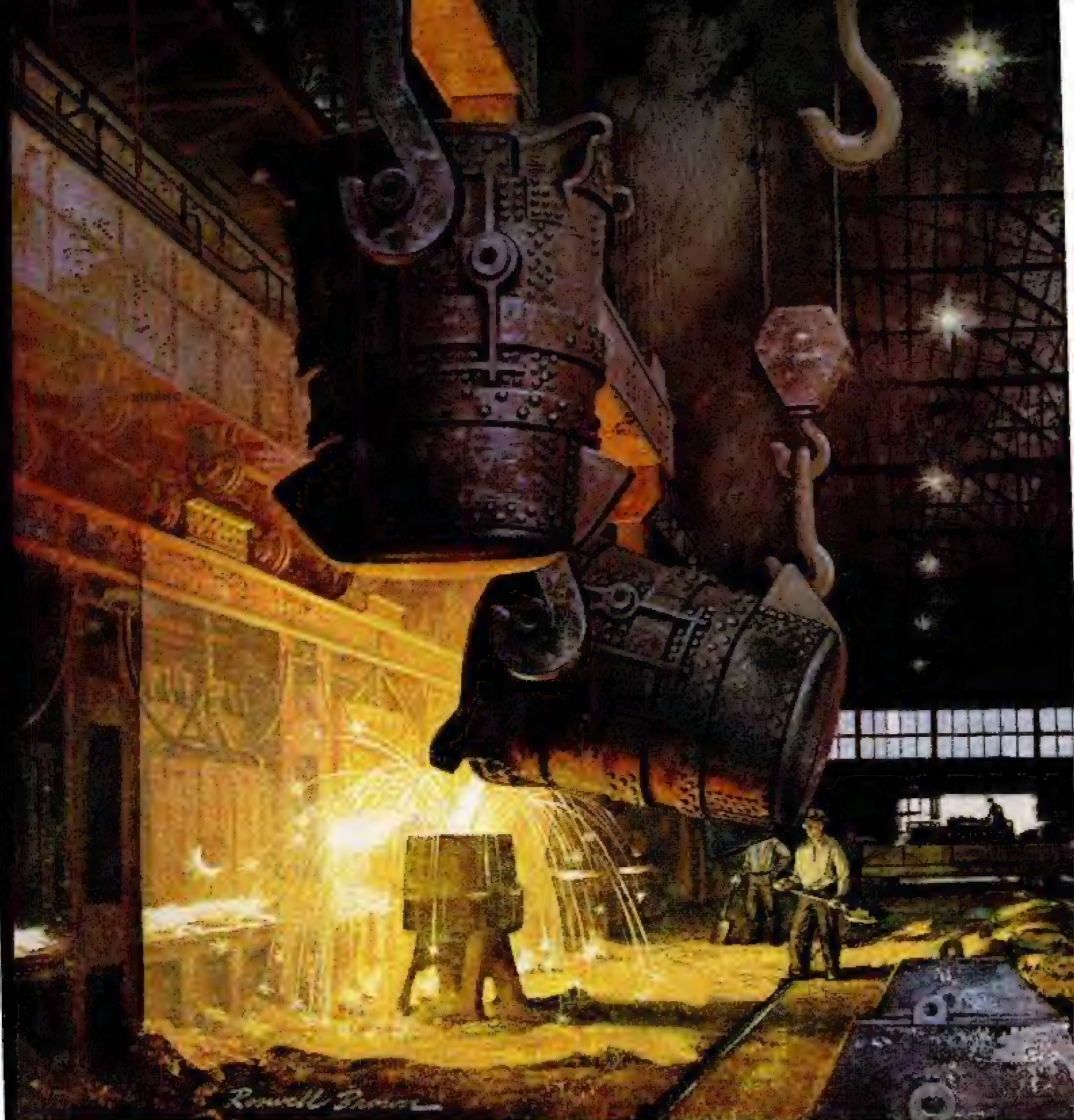
You can harvest crops around the clock if your combine is equipped with a recently developed drier. Permitting farmers to work all night if they please, the unit burns liquid petroleum gas to lower humidity and surface moisture. The unit will harvest grain with 17 to 18 percent moisture and dry it to 14 percent moisture content—the acceptable standard for salable grain.



IN THE SPECIAL SUPPLEMENT which begins on the opposite page, the editors present 40 pages devoted to a great industry which has revolutionized life in America in the last half century. Over the rural pikes and the interstate turnpikes, over the city thoroughfares and industrial streets flows the unbelievable traffic of 44,000,000 automobiles and 9,500,000 trucks carrying the people and the commerce of this nation.

As the shiny new 1953 models begin to stream from the assembly lines we salute the men who build them with their own story—the story of the engineer and designer and factory worker, the story of the old and the new, the story of all of the '53 cars and what they offer you, the motorist. To bring you the portfolio of paintings which follows, Roswell Brown visited the great automobile factories of the Middle West and portrayed in color "The Men and Machines That Build Automobiles."

—Arthur R. Railton
Automotive Editor



Molten metal pours from a giant ladle into a fountain of sparks at one of the Ford open-hearth furnaces

MEN AND MACHINES THAT MAKE AUTOMOBILES

IF THERE is any one symbol for America, it is the automobile. Creating that symbol is another, equally American, symbol—mass production. From the instant ore becomes molten metal until shiny cars roll

off the line, automobile production is the story of man's mechanical genius.

Popular Mechanics commissioned artist Roswell Brown to bring that story to you in this portfolio of superb paintings.



➤ Style designers have to be years ahead of production. Their clay models are to exact scale

◀ Fresh from the forge, a glowing V8 crankshaft is twisted into precise alignment at Chrysler



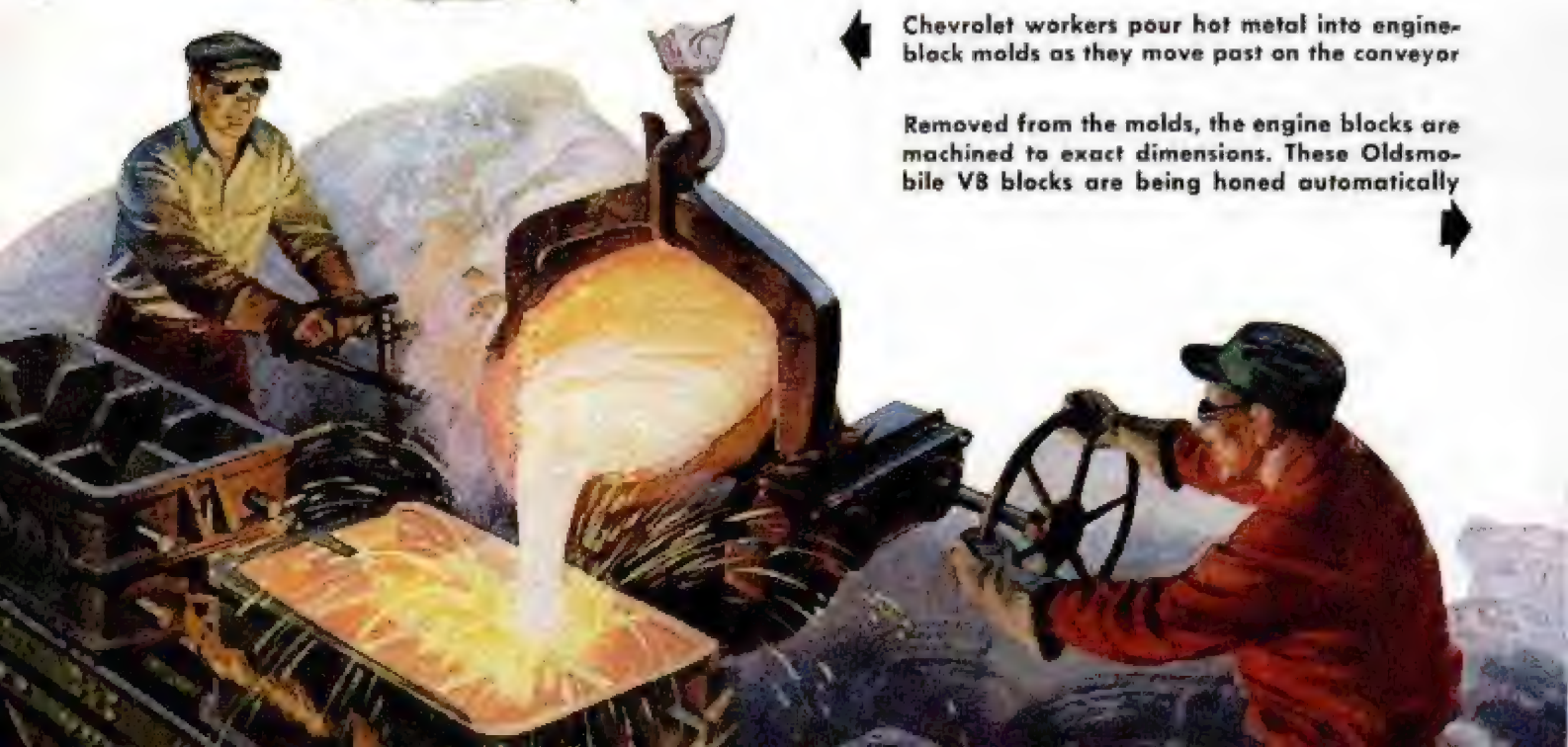
TODAY'S CAR is born as a mere sketch, then grows through a childhood of handmade models until it matures into a mass-produced machine of 13,000 closely fitting parts.

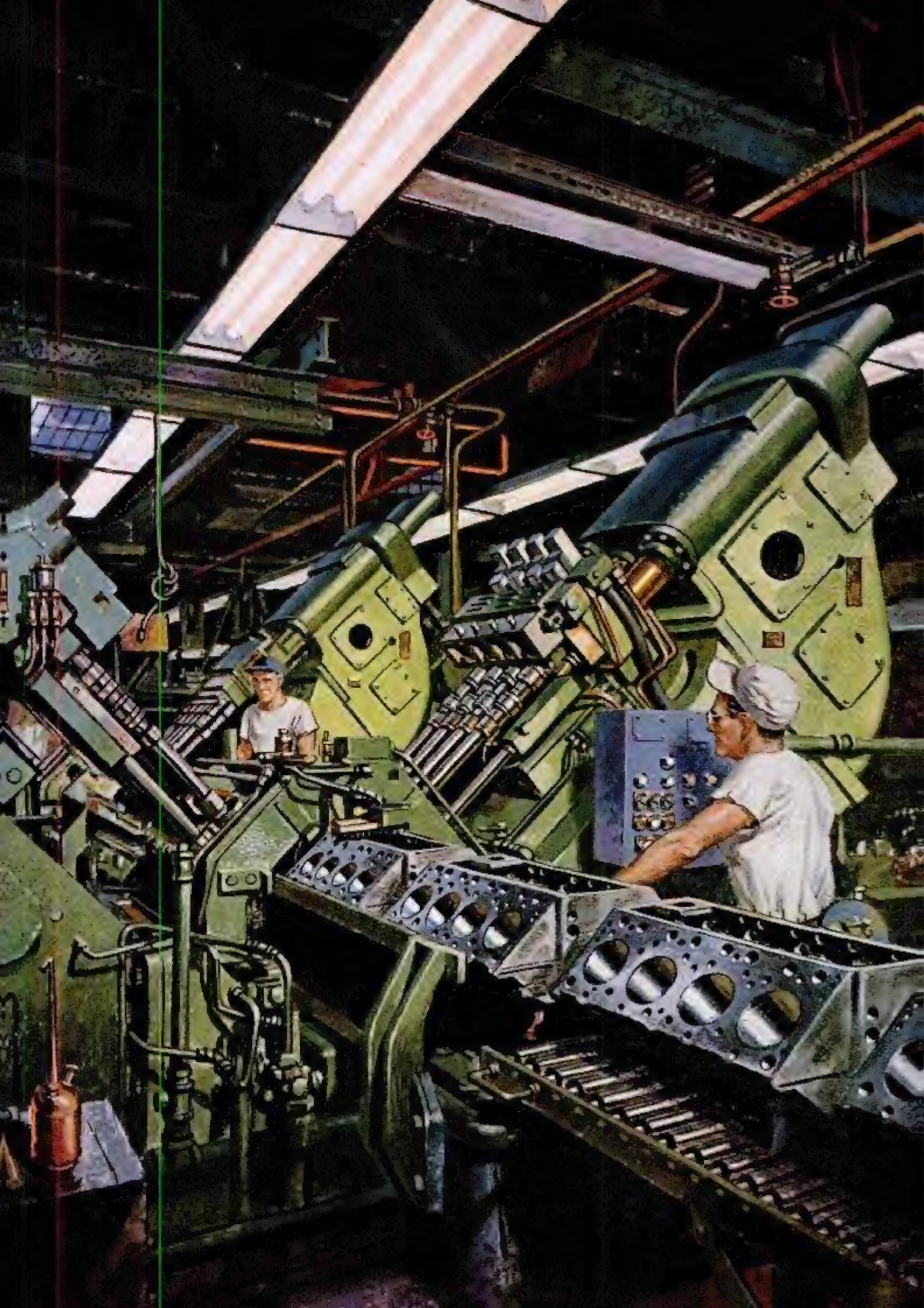
Each part begins as raw material which men and machines convert into crankshafts, blocks, springs, tires and seats in endless procession.

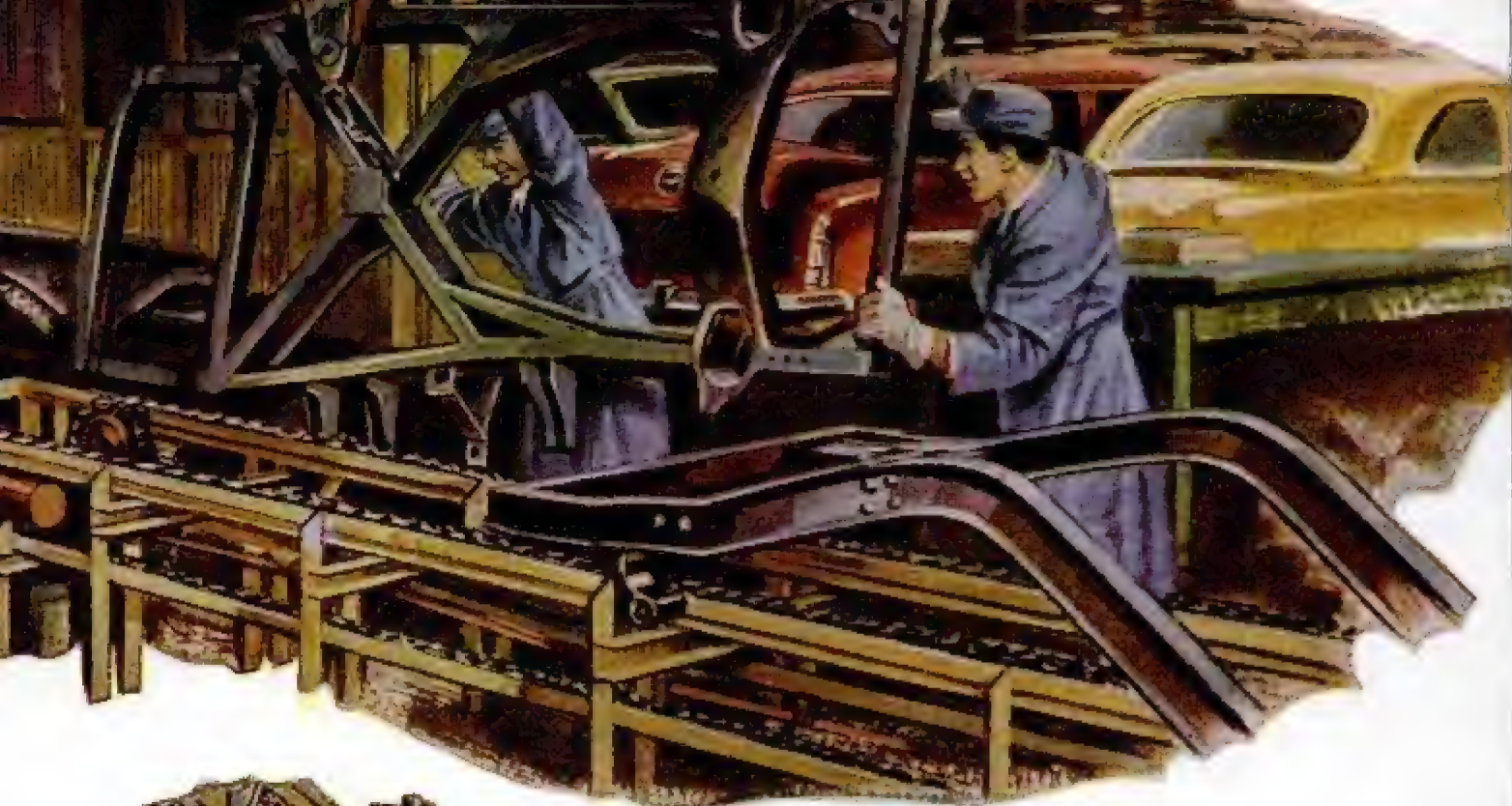
Automatically, rough castings like engine blocks, become precision parts as they move between banks of sensitive machinery that drill, ream and tap the metal with the skill of a fine craftsman.

◀ Chevrolet workers pour hot metal into engine-block molds as they move past on the conveyor

Removed from the molds, the engine blocks are machined to exact dimensions. These Oldsmobile V8 blocks are being honed automatically ➤

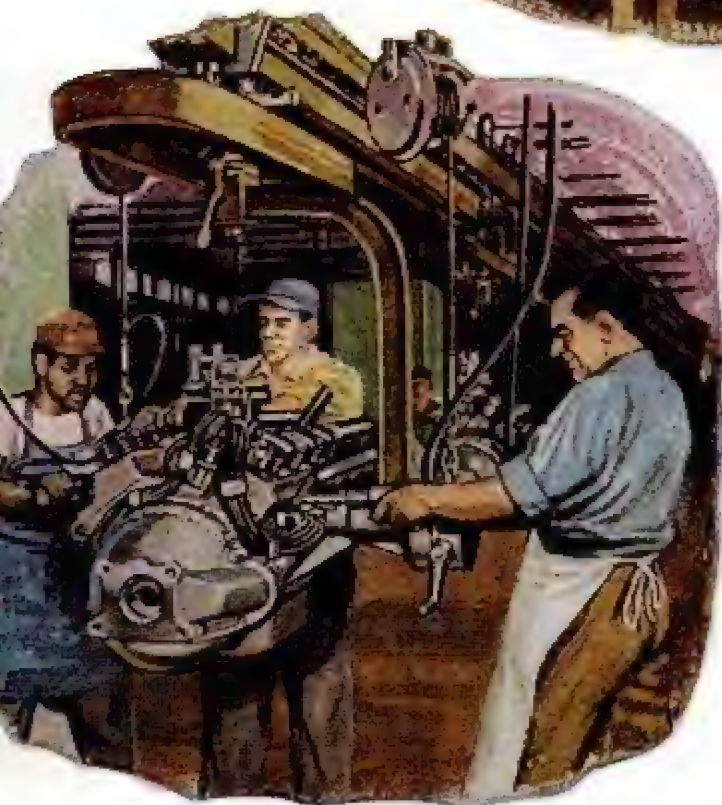






➤ First assembly step is placing a frame on the line. In a few hours, it will be a new Packard

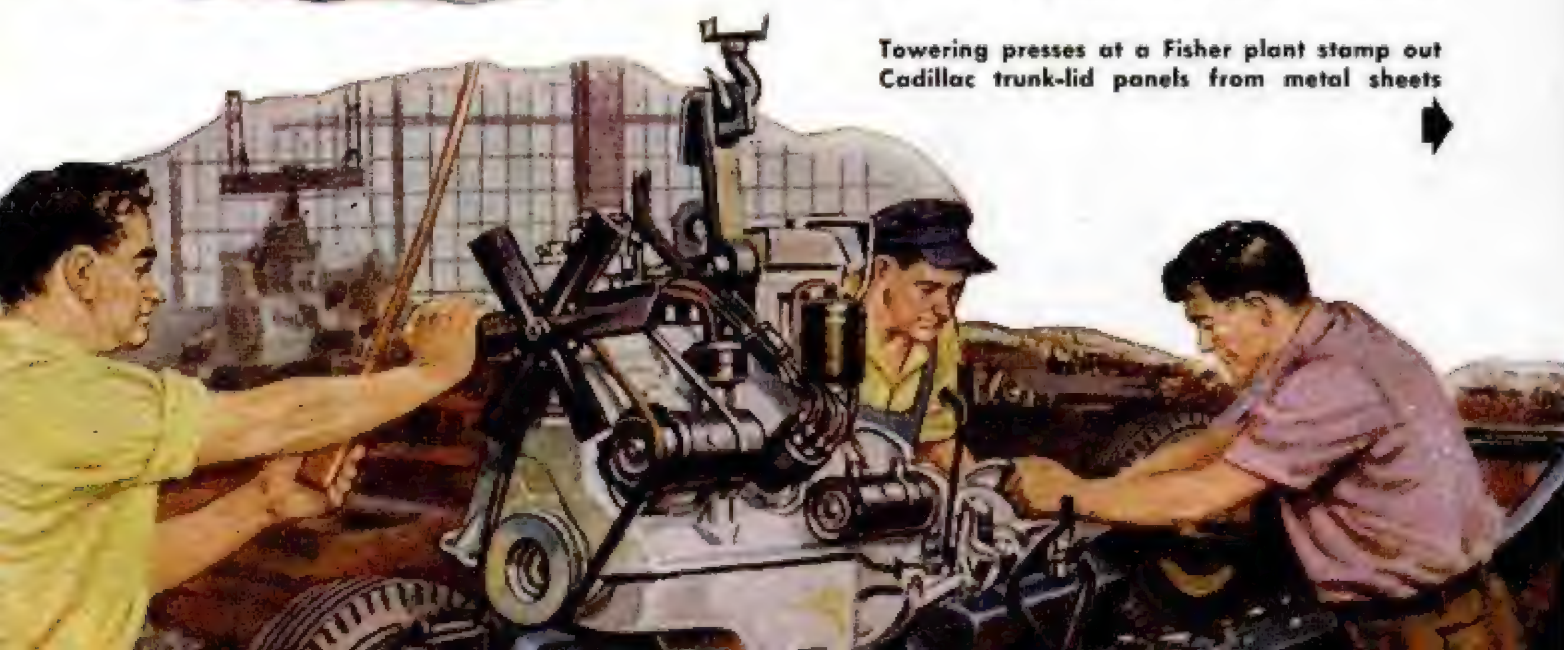
◀ Power wrenches tighten nuts as a Lincoln V8 engine nears the end of its assembly operation

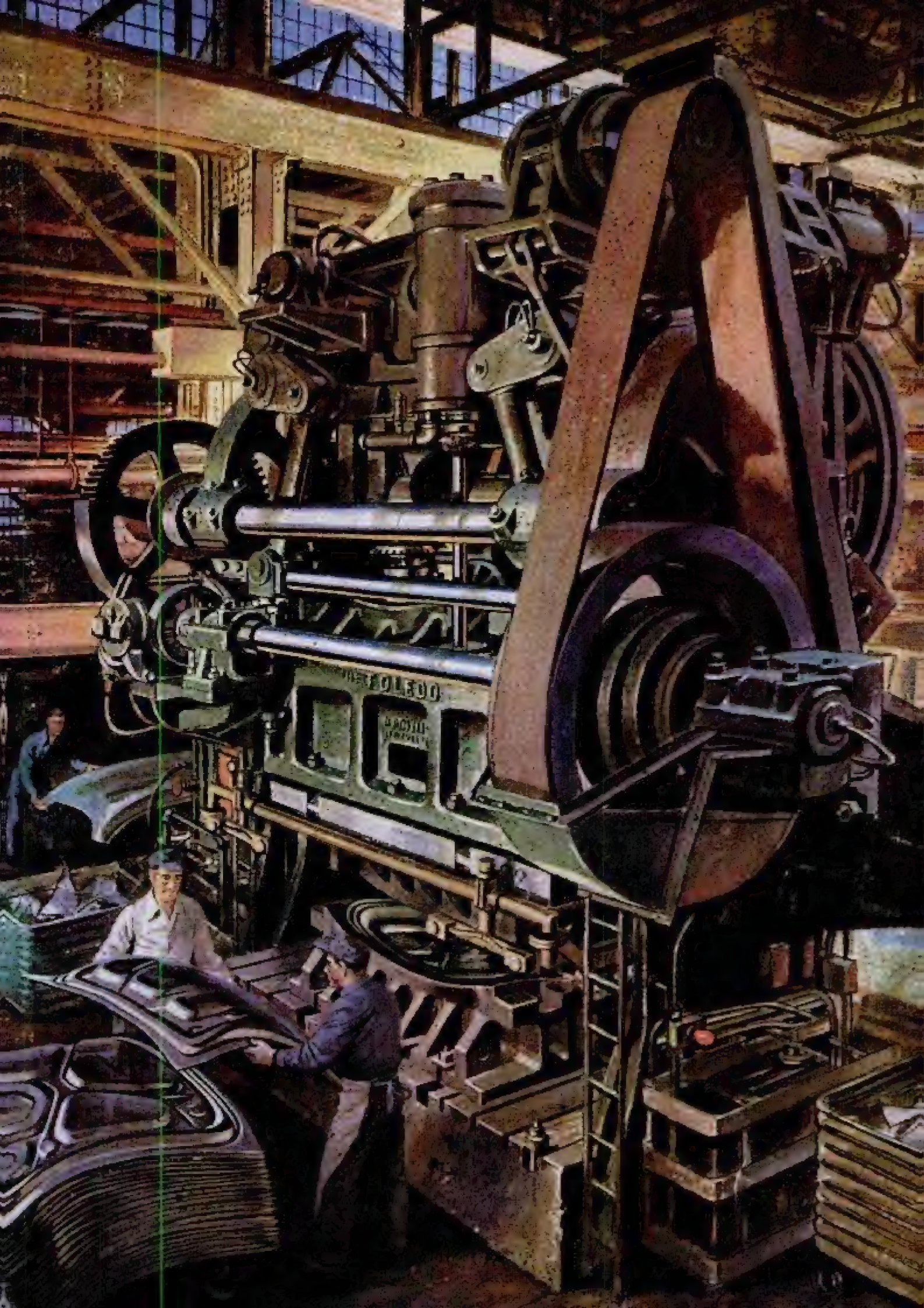


ASSEMBLY involves three elements: Frame, engine and body. A car starts out as a bare frame lowered onto a conveyor. Along a similar line, an engine moves. When these lines join, frame and engine are wedded to form a chassis — the car's working parts. This chassis will be hidden under sheet metal, stamped by giant presses into shapes that become the body and give the car its personality.

➤ Frame and engine are joined at Plymouth. The drive shaft is connected as engine is lowered

Towering presses at a Fisher plant stamp out Cadillac trunk-lid panels from metal sheets







➤ Every car has five wheels. That keeps Kaiser employees busy mounting and inflating tires

➤ Spray painting is done in tunnels like this one at Nash. Colors are changed by switching hoses



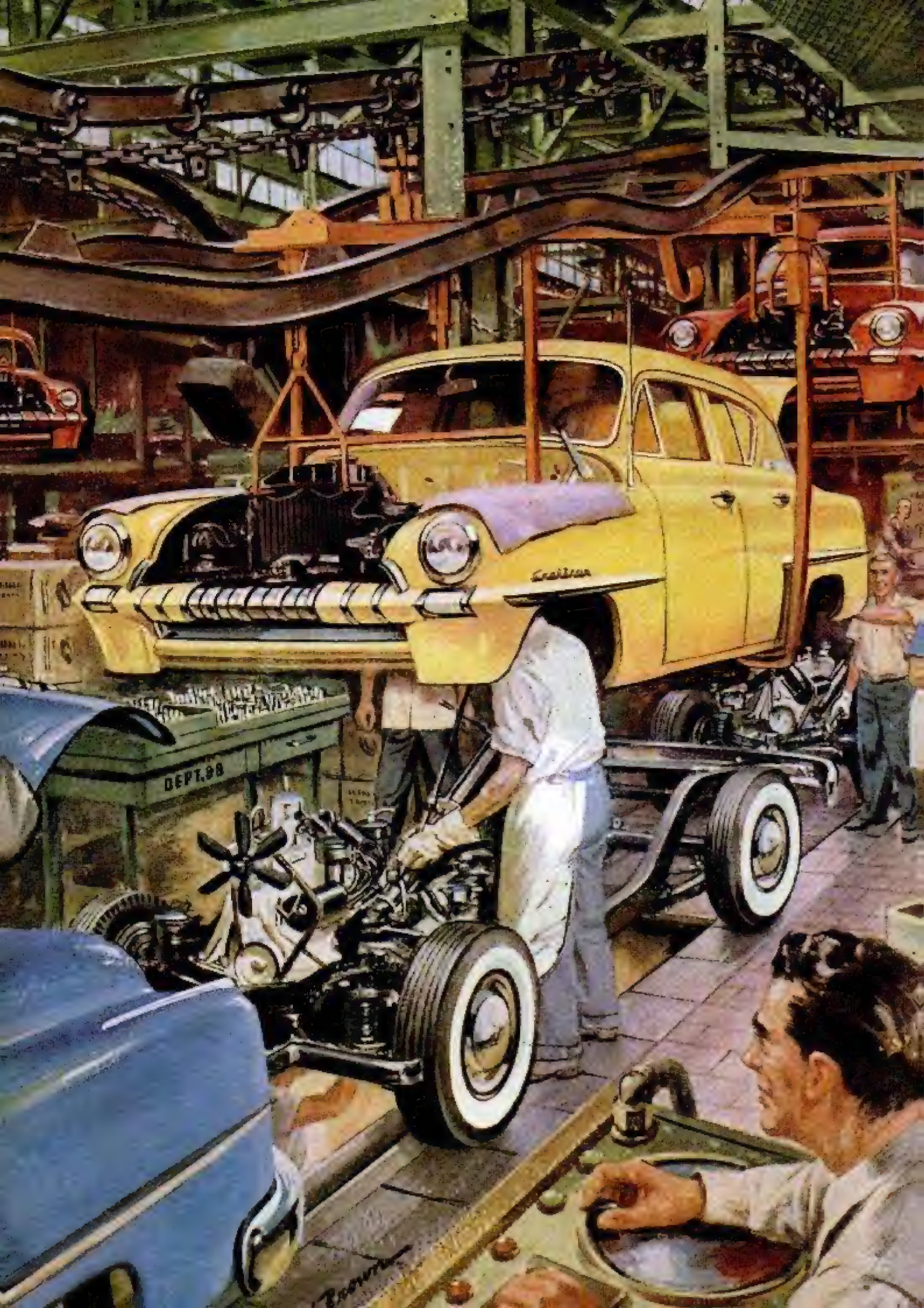
CONVEYORS are everywhere in auto plants. Wheels, bodies, upholstery, all move steadily toward the finish line. Everything is in motion. Intricate body shapes are quickly fitted together like jigsaw puzzles and welded into a unit that proceeds to a spray tunnel where it is painted and repainted until, as the saying goes, it shines like a new car. From the rough work of the body shop to the delicate sewing of fabrics, a car requires a variety of skills.

➤ Women sew upholstery as men install hardware and lush interior finishings of a modern car

Working as a team, Studebaker welders lock body pieces in a huge jig and fuse them into a unit amid a spectacular display of sparks









Precise control is needed as body and chassis come together to form a new Plymouth. Man in foreground synchronizes speed of the two lines

After this final check, the engine is started and a new Dodge rolls off under its own power

MOST DRAMATIC step is the body drop where chassis and body are joined. By a miracle of planning, as the overhead conveyor drops a body of a particular style and color, beneath it is the correct chassis with matching wheels and whatever extras the buyer ordered. On to the final line goes the car—as perfect as months of testing on proving ground and highway can make it. After a final check of engine and lights, the car is on its way to you.



Months before production starts, new models, like the Ford, are tested at proving grounds

A few hours ago, this Hudson was just parts stacked in the plant. Now it is ready to go!



"PARADE OF 1953 CARS"

Here they come—the bright new models from assembly lines of the 19 motorcar makers. With an introduction by Siler Freeman, our automotive correspondent in Detroit, we present them all—from Buick to Willys

THE ARRAY of new models in this issue shows more than the usual amount of evolutionary changes on which the industry prides itself every year. One important trend is that in many lines wheelbases are getting shorter. A notable exception is Pontiac, which has added two inches. The cars that have gone to V8 high-compression engines were able to take as much as four inches from their wheelbases. Overall lengths, however, remain almost the same as last year.

Dodge uses a 114-inch wheelbase for its hardtop coupe and convertible and a 119-inch wheelbase on other body styles. Buick has brought its Roadmaster down to the same wheelbase as the Super. The Plymouth, among the smaller cars, has cut down from 118 to 114-inch wheelbase. Ford and Chevrolet remain the same, one inch longer than their rival.

Power steering shows a tremendous growth and appeal for a comparatively new and expensive device. It has been brought down to the medium-price sector of the market by Pontiac and Buick Special. Chevrolet is offering it in the low-price field. Studebaker has an all-mechanical power-steering unit in its Commander line and is planning to offer it in the Champion later. Dodge did not carry out the Chrysler

trend to power steering because its greatly shortened hood made it impossible to put the mechanism under it.

Air conditioning is something new in the luxury-accessory line. Both Cadillac and Chrysler feature it in the high-price models, as do Oldsmobile and Buick. Thus far, the other companies are watching what happens to these pioneers.

The V8 engine continues to displace the straight eight and six. Buick is the third GM division to switch. Pontiac and Chevrolet must wait another year, perhaps two, because the intricate tooling required takes a long time and the shops are full of defense work. Dodge joined the V8 lines this year. Plymouth still waits. But it won't be long before it joins the parade, too.

Despite preseason predictions about overhead-valve engines, Ford and Mercury continued to use their veteran V8. But the recent visit this observer paid to the engine plant in Cleveland disclosed signs of preparation for a new Mercury power plant. It will be late 1953 before it gets into production—and for 1954 models only.

Buick has adopted power brakes while Cadillac officials turned thumbs down.

Oh, yes, one more pleasing feature: Prices are the same as for 1952 and in a few instances a little lower! ★ ★ ★

Buick has a V8 engine in its Roadmaster and Super series. The Special still uses the straight eight. Main differences between the two V8s are carburetion and compression ratios. Horsepower is 138 in the Roadmaster, 164 in the Super. Bodies are basically the same as 1952. Changes were made in the grille, rear fender and headlights. A 12-volt electrical system is used in the V8 models



CADILLAC



Adding 20 horses, Cadillac now puts out 210 horsepower in its 1953 V8 engine. Compression ratio is up to 8.25 to 1. Strangely enough, this luxury car is talking gasoline economy with a rear-axle ratio

of 3.07 to 1. The electrical system has 12 volts for improved ignition. The body is changed slightly. Grille is more massive and protected by bullet-type guards. Also new are the "eyelids" on the headlights

CHEVROLET



With all-new bodies, Chevrolet has also improved its Powerglide transmission and boosted horsepower for better performance. The Powerglide 115-horsepower engine has aluminum pistons and a 7.5-to-1 compression ratio. Standard engine is 108 horsepower. The Bel Air series of four luxury body styles was also introduced this year. Power steering is available

Lower and wider than previously, the Chrysler has a sleek look in its completely new body styles. Engines are virtually unchanged from last year, although the six has been given better performance. On V8 models, the electrical system is 12-volt. Emphasis this year is on the new body. Fender lines are now continuous. Power steering and air conditioning are available

CHRYSLER





Five inches longer over-all than in 1952, the DeSoto has an all-new body that is about two inches wider and an inch lower. A reworking of the front grille has eliminated the "bucktooth" look of last year.

Designers have added sleekness by extending rear fenders and lowering the rear deck. Continued are the 160-horsepower FireDome V8 and Powermaster 6. Full power steering is available with both series



When Dodge says it has an all-new car, it means it! This year's models have complete body restyling and a 140-horsepower V8 engine that features a square design—meaning its stroke is less than its bore. That results in a sturdier block, reduced friction. Wheelbases have been shortened for easier handling, yet passenger space inside the bodies is unaffected



Basically, the 1953 Ford is unchanged from last year. Body changes are simply face lifting and include a cleaner front grille and a chrome strip along the rear fender. Suspension improvements in the front end have increased the comfort of the ride and are said to make the car hug the road at high speeds. Both the V8 and 6 engines are continued, of course

HENRY J



When the Henry J first appeared, it had nary a frill. Each year refinements were added and by 1953 this low-priced car can boast a padded instrument panel, seat cushions that are softer and deeper and dome

lights that operate with the doors on all models. The cars are from 3 to 6 inches longer this year. Capacity of the oil-flow system is increased and the clutch is better. Basically, the Sears Allstate is identical



HUDSON

Basic body styling of the 1953 Kaiser is unchanged from last year. However, engine performance has been improved by a new manifold, muffler and exhaust assembly. Kaiser continues to plug safety and has a padded crash panel and pop-out windshield. Styling changes were made in chrome and headlight treatment

For the biggest news from Hudson see page 113 and the story of the Hudson Jet, the new light car. But Hudson is still making the Wasp, Super Wasp and Hornet, famed stock-car racer. Its step-down design makes for a low center of gravity. Exterior style changes are slight. The front grille is cleaner and an air-scoop (non-functional) hood ornament is new

KAISER



LINCOLN



Fresh from a clean sweep of the Mexican road race, Lincoln is talking power this year. Improvements in engine "breathing" have boosted horsepower to 205. Compression ratio is now 8 to 1. The result is the

powerful automobile that took the first four places in Mexico. To power steering and braking has been added a power front seat, adjustable in four ways. Body styling is unchanged except for ornamentation



MERCURY

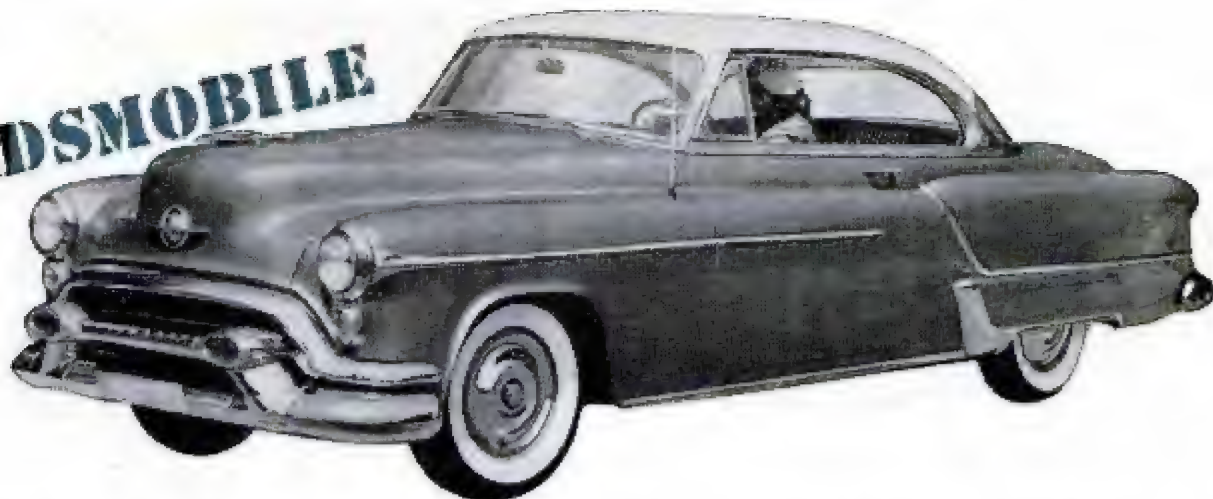
Nash is emphasizing its hardtops, the Country Club models. Chrome "teeth" in the air intake below the windshield and a hood ornament are the only style changes. The Statesman has 100 horsepower, 7.45 to 1 compression ratio. Ambassador engine is unchanged, but a LeMans Dual Jetfire 140-horsepower engine is optional. The new-styled Rambler is not yet released

Like its brothers, Ford and Lincoln, the Mercury is little changed from 1952. Performance is improved by a new air cleaner and exhaust system. The straight-through muffler and larger tail pipe decrease back pressure and give faster acceleration. Horizontal bits of chrome on the rear fender are new as is the chrome side molding that makes the body look longer

NASH



OLDSMOBILE



Most noticeable change in Oldsmobile's styling is the higher and squarer hood line. Bumper and grille assembly is new with its clean, uncluttered design. Compression ratio on the 165-horsepower "98" engine

has been boosted to 8 to 1. Also new this year is an optional padded instrument panel. The upper part is foam rubber covered with plastic. For those who can afford it, Olds also has optional air conditioning



PACKARD

Aiming for the luxury market, Packard is putting out two distinct lines—one in that high-price field and another, the Clipper, in the medium-price class. Body styling is unchanged except for minor details. Boosts have been made in horsepower and compression ratios on all models. The 180-horsepower engine has a four-barrel carburetor, chrome-plated piston rings

Wearing an all-new body, Plymouth has a sleek look that the previous cars lacked. Over-all height has been reduced slightly. By moving the engine forward, engineers increased interior space. Front and rear suspension is improved. Horsepower and compression ratio are higher. The bolt-on rear fender is gone and the fender line is continuous from front to rear

PLYMOUTH





More knee room in the rear seat of the 1953 Pontiac is the result of its two-inch-longer wheelbase. Rear-seat cushions are deeper, too. The whole body is new although retaining the Pontiac personality. Torque

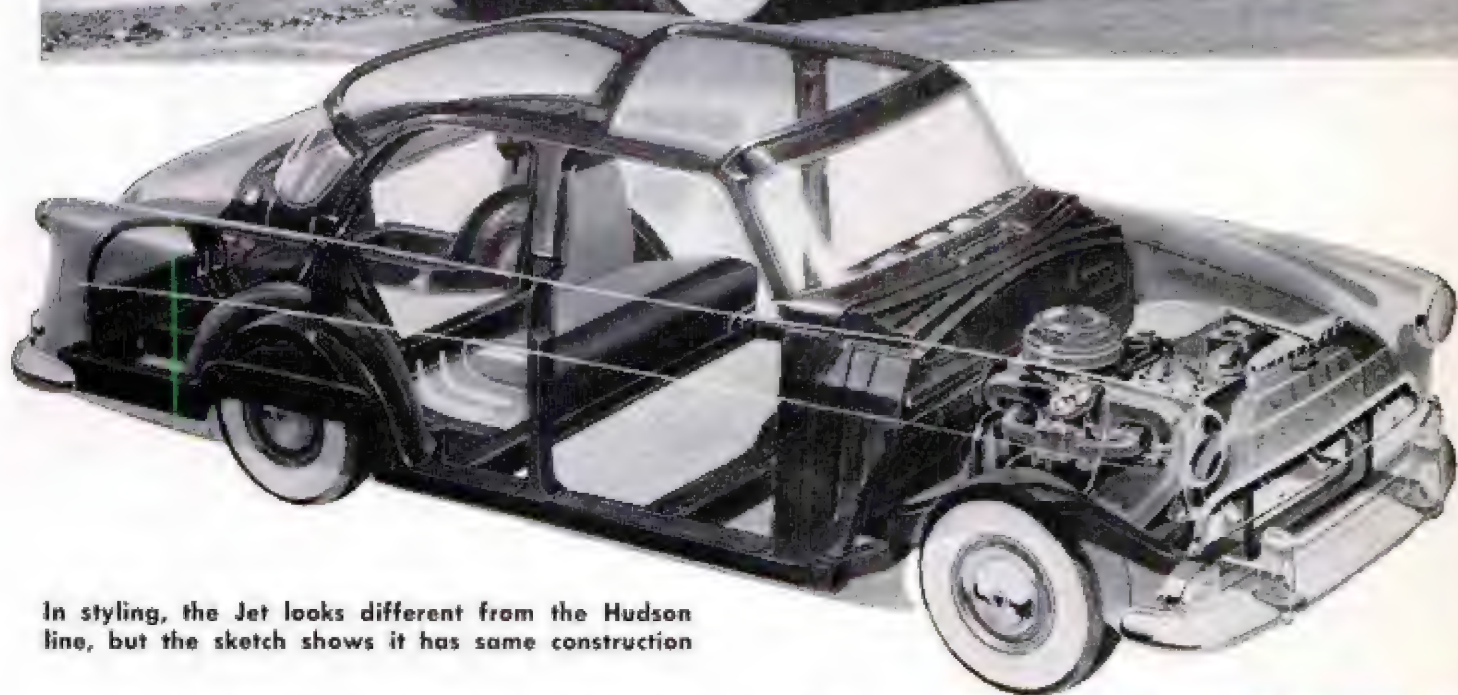
has been boosted on the six-cylinder engine which now has a dual carburetor similar to the one on the eight. Biggest change is in the front-wheel suspension which makes the car easier to handle on curves



After producing only two-door models in its first year, Willys has introduced a four-door sedan and a hardtop model. The Eagle hardtop is powered by the 90-horsepower Hurricane 6, with a compression ratio of 7.6 to 1. The four-door sedans, available in all series, have 61-inch seats, front and rear, and wide doors for easy access. Legroom has been increased

Studebaker presents two all-new bodies: One is the "family" line (shown here); the other is a hardtop, or "sports," line (see page 136). Both have a lower hood line, concave side panels, fin-type rear fenders. Sports-line wheelbases are four inches longer. This year's engines are unchanged. Mechanical power steering, rather than hydraulic, is available on the Commander now, is expected to be on Champion later





In styling, the Jet looks different from the Hudson line, but the sketch shows it has same construction

HUDSON'S NEW LIGHT CAR—**THE JET**

HUDSON HAS JUMPED into the low-price field with a 105-inch-wheelbase car called the Jet (see cover)—the only new name introduced by the industry this year. Available only in four-door models as yet, the Jet has a 104-horsepower engine, a small version of the Hornet, with 7.5 to 1 compression ratio. An optional head boosts that to 8.0 to 1. Regular gasoline is used.

Even though it is a small car (Hudson prefers to call it a compact car), the Jet is roomy. It seats six persons, its front and

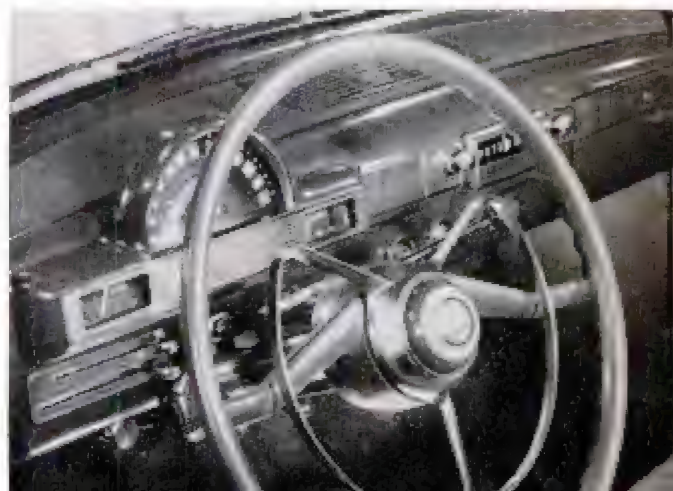
rear seats having 58-inch widths. Maneuverability is excellent as the 33-foot turning circle proves.

Construction features include the all-welded Monobilt body and frame used in the big Hudsons. Step-down design is also built into the Jet to give it a low center of gravity for safer handling at high speeds.

Optional at extra cost are such features as Dual-Range Hydra-Matic Drive, Twin-H Power and tinted glass. Various rear-axle ratios are also available.

Despite its small size, the Jet will seat three in each seat. Interiors on the Super Jet models are especially luxurious

Steering wheel has only two spokes—bent for a rakish effect. Dash design is simple





FORD is sporting a jet-tube taillight, below. It is said to be more easily seen from the side or rear and is even brighter than the '52 design



CHRYSLER trunks are 44 percent larger and have wider lids for easier loading. The gas-filler cap is in the rear, below the lower-left corner of trunk lid



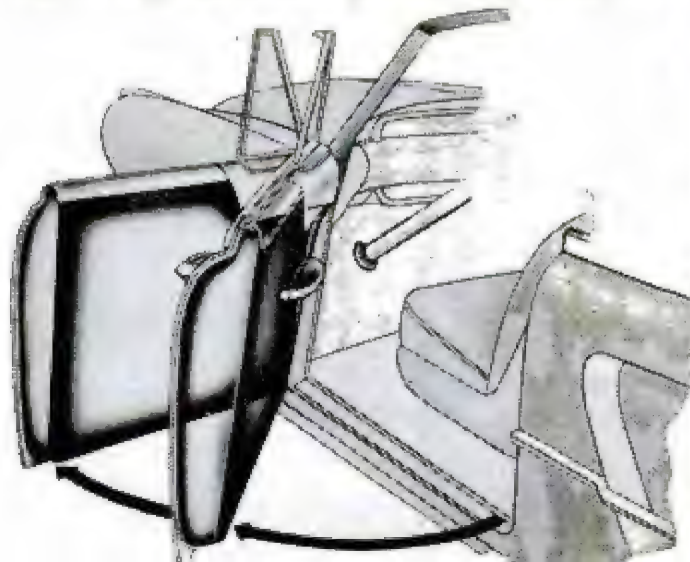
KAISER'S upholstery is a bright departure in styling. Doors and center posts use the fabric too

What to See -

BUICK owners who want the sporty look can get it with a set of "wire wheels" that simply bolt onto the regular wheels



MERCURY, Lincoln and Ford are featuring new door checks that hold the doors either fully open or half open, a big help in close quarters like parking lots



CHRYSLER has widened its rear doors, especially at the top, making it unnecessary to crouch when you get in and out. The rear window is much larger also





BUICK has moved its parking lights from inside the bumpers to a safer position beneath the headlights



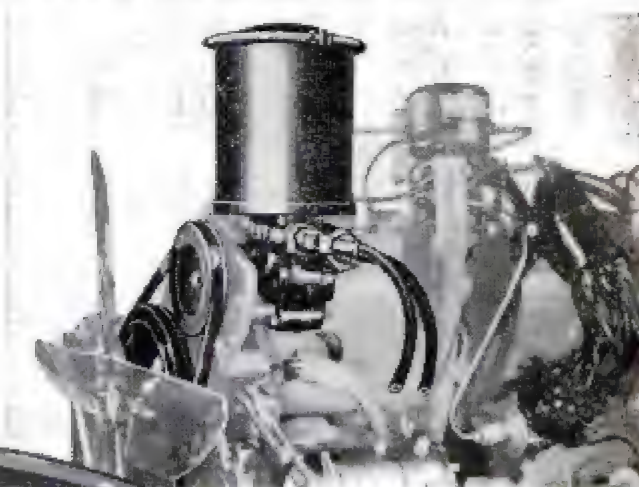
LINCOLN front seats move up and down as well as forward and backward. Electric motors do the work!

in '53



OLDSMOBILE moved the Hydra-Matic indicator into speedometer (see arrow)

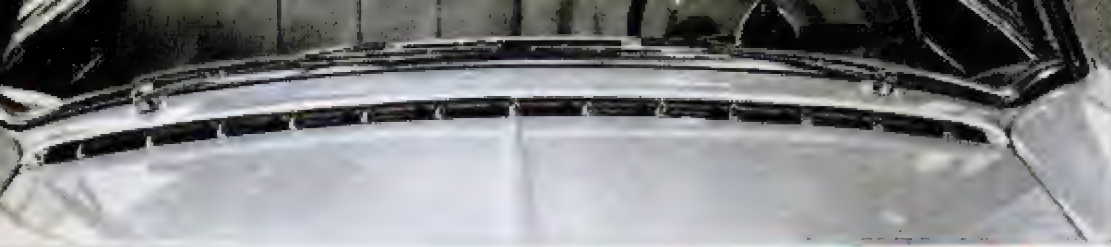
PACKARD (and other lines too) has optional power steering. Providing the power is this pump and reservoir atop the Packard engine



OLDSMOBILE cools you with air conditioning. Condenser is ahead of radiator; compressor atop the engine; cooling unit in the trunk forces cool air into car via perforated ducts that run along roof

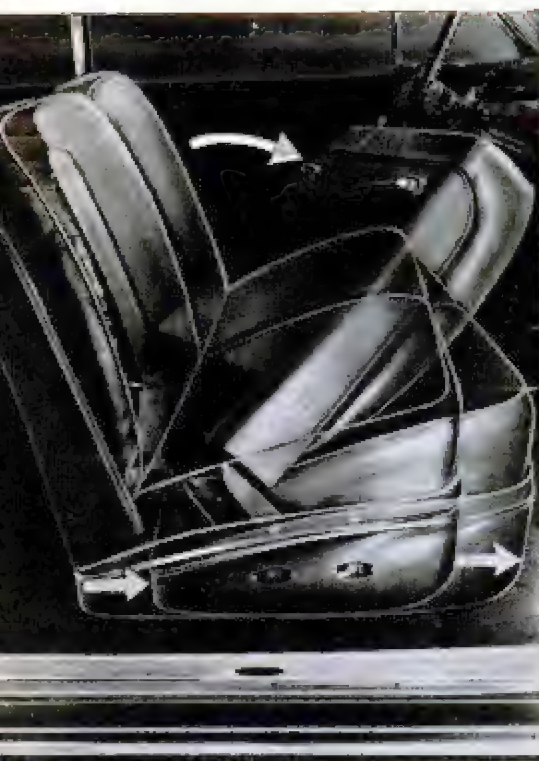
HENRY J has installed a crash pad on top of its instrument panel



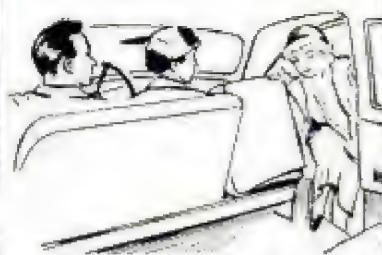


NASH has added chrome "teeth" to the air intake that runs full width of hood. Also new (not shown) is a Petty-girl ornament on hood

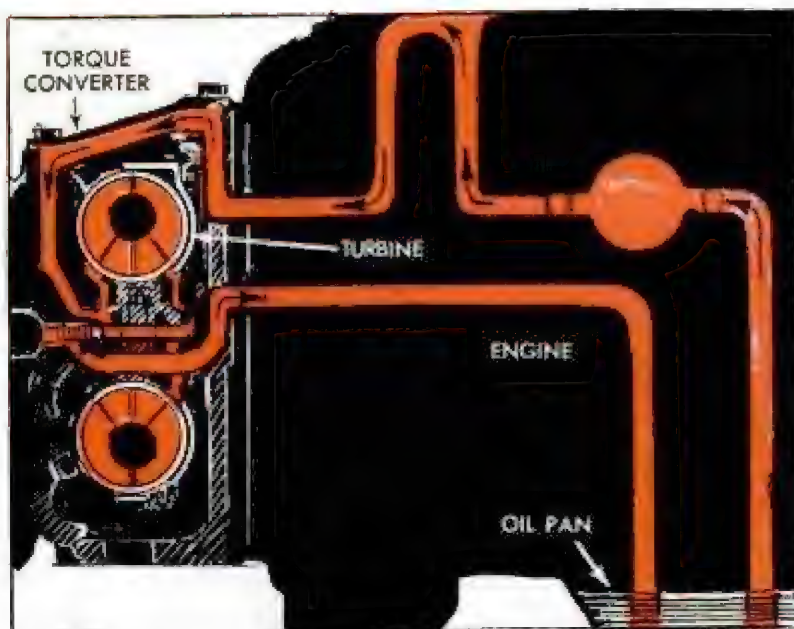
What to See-in'53



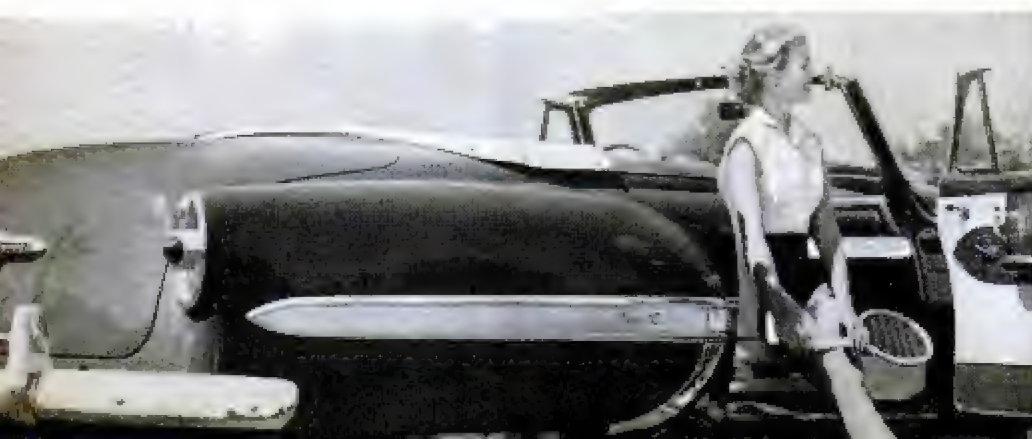
BUICK Roadmaster and Super two-door models have a sliding front seat that pivots forward 4½ inches as back is tilted down to increase the space between doorframe and seat, making access to rear easier



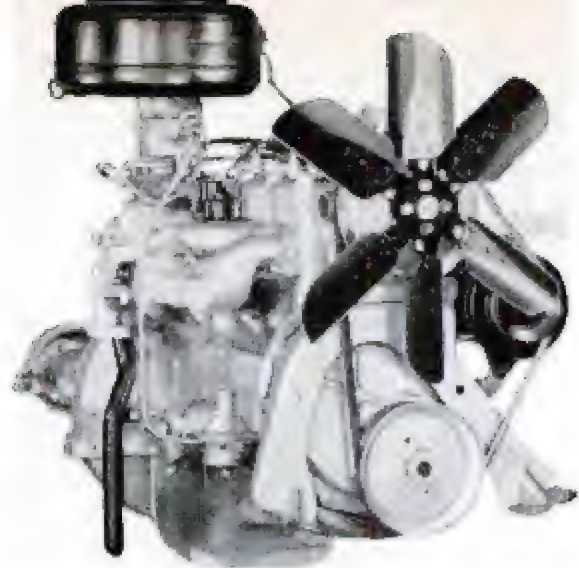
PLYMOUTH divided the front seat on its two-door models so two persons sit undisturbed while the back tilts forward for entry to rear



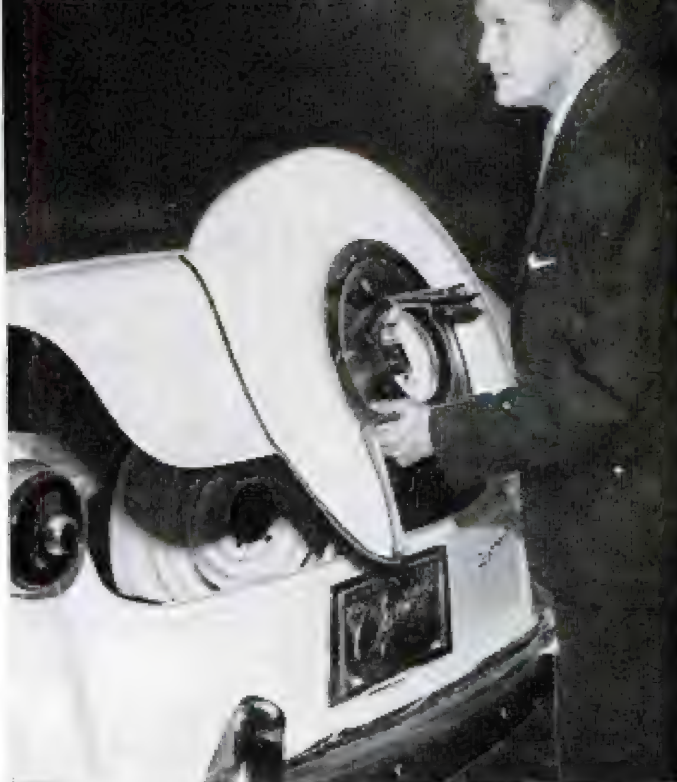
DODGE V8 engines share their oil supply with the torque converter, making it necessary to change oil only twice a year. The combined oil system takes 12 quarts. Arrows show oil flow



CHEVROLET gives its Bel Air series a distinctive look by a chrome-trimmed stripe on the rear fender. The taillight design is also new this year



PLYMOUTH uses a six-bladed fan this year. Diameter is smaller and fan speed decreased. Change was made necessary by lower hood line

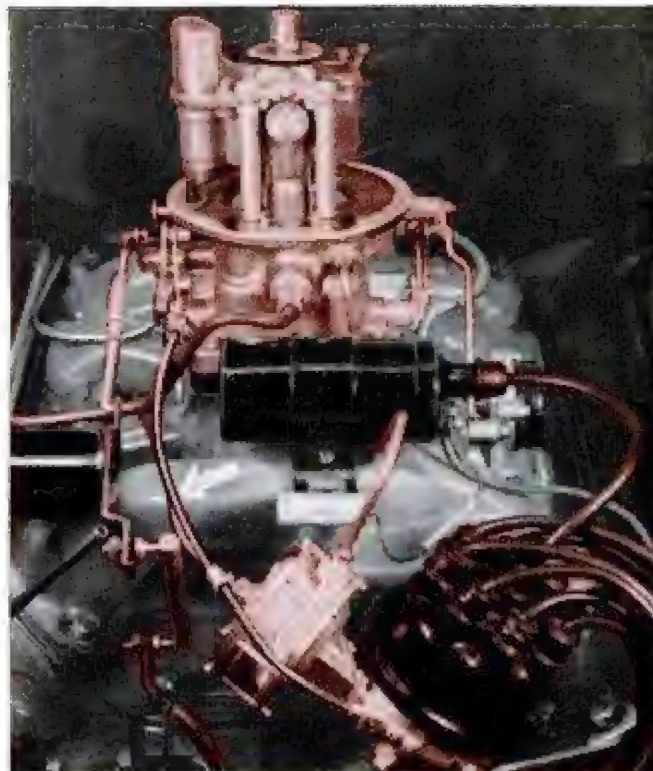


FORD offers as optional a false "continental" tire cover. It bolts to trunk lid and has no tire inside



HUDSON'S new Jet has its gas-tank cap in the back just below the trunk lid. It is concealed behind a hinged cover

PONTIAC has an all-new body — even to the extent that its hallmark, the chrome stripes, has been changed. Now there are six of them in groups of three each, separated by a band of body paint



LINCOLN increased power with a four-barrel carburetor and a fast mechanical spark control (arrow)

DODGE joined the hole-in-hood club (left) by using its emblem as a vent. Hudson (center) added an ornament that looks like a vent but isn't. First with a functional vent in 1952, DeSoto (right) streamlined it this year



PRICE FOUR-DOOR SEDAN	SHIPPING WEIGHT	OVER-ALL LENGTH	WHEELBASE	OVER-ALL WIDTH	STEERING RATIO	TURNING CIRCLE	FRONT-SEAT WIDTH	REAR-SEAT WIDTH	FRONT-SEAT HEIGHT	TAXABLE HORSEPOWER	BRAKE HORSEPOWER AT R.P.M.	BORE AND STROKE	DISPLACEMENT	COMPRESSION RATIO	TORQUE RATING AT R.P.M.
1000	2000	180	100	55	15:1	20	45	45	45	100	100	4.0	180	10:1	100

[illegible]

HUDSON	Jet	\$1685	N.A.	181	105	67	N.A.	33	58	58	14.3	21.6	104 at 4000	3.00x4.75	202.0	7.5	158 at 1600
	Wasp	2106	3380	202	120	77	18.2	39	64	64	12.1	21.6	112 at 4000	3.56x3.88	232.0	6.7	175 at 1600
	Super Wasp	2252	3480	202	120	77	18.2	39	64	64	12.1	30.4	127 at 4000	3.56x4.38	262.0	6.7	200 at 1600
	Hornet	2530	3570	208	124	77	20.4	41	64	64	12.1	34.9	145 at 3800	3.81x4.50	308.0	6.7	257 at 1800
KAISER	Deluxe	\$2316	3210	209	118	74	25.0	38	63	63	11.2	26.3	118 at 3650	3.31x4.38	226.2	7.3	200 at 1800
	Manhattan	2444	3275	212	118	74	25.0	38	63	63	11.2	26.3	118 at 3650	3.31x4.38	226.2	7.3	200 at 1800
LINCOLN	Cosmopolitan	\$3226	4262	214	123	78	26.1*	45	62	62	13.5	46.2	205 at 4000	3.80x3.50	317.5	8.0	305 at 2000
MERCURY	V8	\$2057	3485	205	118	74	26.4	40	59	59	13.0	32.5	125 at 3800	3.19x4.00	255.4	7.2	218 at 1700
NASH	Rambler	1953 Rambler specifications not available															
	Statesman	N.A.	3045	202	114	78	24.0	43	65	65	13.0	23.4	100 at 3800	3.13x4.25	195.6	7.5	155 at 1600
	Ambassador	N.A.	3480	209	121	78	25.5*	45	65	65	13.0	29.4	120 at 3700	3.50x4.38	252.6	7.3	220 at 1600
OLDSMOBILE	"88" V8	N.A.	3704	204	120	77	21.3*	43	63	63	13.7	45.0	165 at 3600	3.75x3.44	303.7	8.0	284 at 1800
	"98" V8	N.A.	3864	215	124	77	21.3*	43	63	63	13.5	45.0	165 at 3600	3.75x3.44	303.7	8.0	284 at 1800
PACKARD	Clipper	\$2588	3725	213	122	78	27.8*	N.A.	63	62	14.0	39.2	150 at 4000	3.50x3.75	288.0	7.7	260 at 2200
	Patrician 8	3735	4190	218	127	78	30.9*	N.A.	63	62	14.0	39.2	180 at 4000	3.50x4.25	327.0	8.0	300 at 2000
PLYMOUTH	Cranbrook	\$1772	3007	189	114	73	18.2	39	60	59	14.3	25.4	100 at 3600	3.25x4.38	217.8	7.1	177 at 1200
PONTIAC	Chieftain 6	\$1843	3381	203	122	77	25.0*	40	60	61	13.9	30.5	115 at 3800	3.56x4.00	239.2	7.0	193 at 2000
Chieftain 8		1913	3456	203	122	77	25.0*	40	60	61	13.9	36.5	118 at 3600	3.38x3.75	268.4	6.8	222 at 2200
STUDEBAKER	Champion 6	N.A.	2790*	199	117	70	19.0	40	59	60	14.0	21.6	85 at 4000	3.00x4.00	169.6	7.0	138 at 2400
	Commander V8	N.A.	3150*	199	117	70	20.0*	40	59	60	14.0	36.4	120 at 4000	3.38x3.25	232.6	7.0	190 at 2400
WILLYS	Aero Lark	\$1580	2487	181	108	72	23.7	38	61	61	11.0	23.4	75 at 4000	3.13x3.50	161.0	6.9	125 at 2000
	Aero Eagle	1980	2583	181	108	72	23.7	38	61	61	11.0	23.4	90 at 4200	3.13x3.50	161.0	7.6	135 at 1600

◆ Dimensions in this column have been rounded out to nearest whole number. N.A. — Not available at press time. * Estimated.
 All specifications are for four-door sedans except Henry J (Two-door sedan) and Willys Eagle (Two-door sedan).
 Prices do not include taxes, shipping and handling charges.

◆ Power steering available.

Scoreboard of 1952 Automobile Production

THE BIG THREE

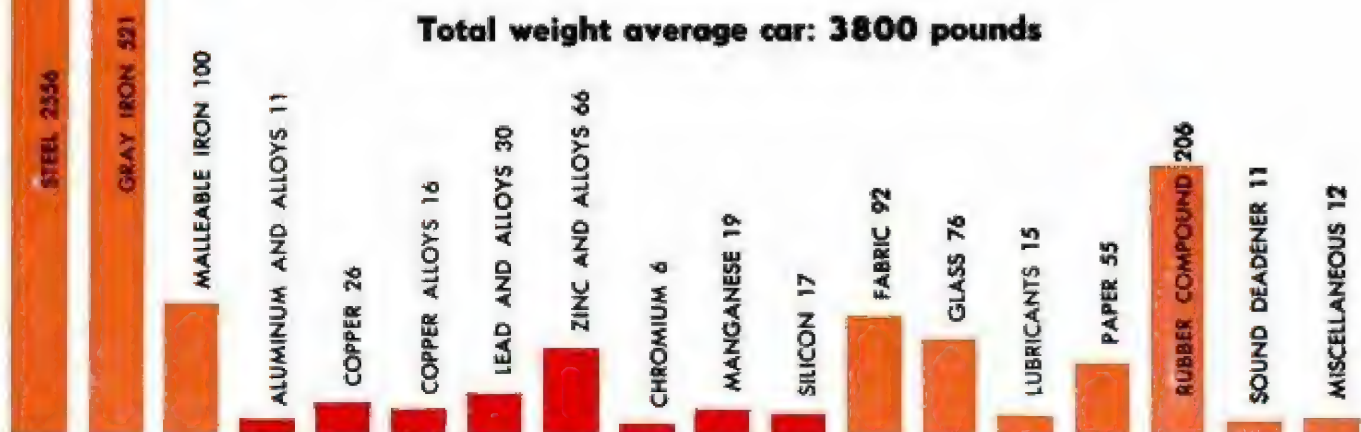
GENERAL MOTORS	1,709,274
FORD MOTOR COMPANY	915,322
CHRYSLER CORPORATION	847,638
	50,000 100,000 150,000 200,000 250,000 300,000 350,000 400,000 450,000 500,000 550,000 600,000 650,000 700,000 750,000 800,000 850,000
Chrysler	106,980
DeSoto	67,450
Dodge	229,406
Plymouth	423,822
Ford	708,123
Lincoln	29,655
Mercury	177,344
Buick	303,713
Cadillac	90,716
Chevrolet	848,370
Oldsmobile	213,890
Pontiac	252,385
Kaiser	69,144
Hudson	71,420
Nash	141,966
Packard	55,481
Studebaker	157,862
Willys	52,701

Passenger-car production by the nation's leading manufacturers as estimated by the Automotive News. Period covered is from January 1 to December 8, 1952

What Are Motor Cars Made Of?

An average car contains a diversity of material. Miscellaneous group includes antimony, molybdenum, nickel, tin, plastics, cork, tungsten, asbestos, mica and vanadium. Numbers represent pounds

Total weight average car: 3800 pounds



Left to right: George Walker, designer for Ford; William Graves, Packard vice-president; and Edward Macauley, Packard chief styling engineer



American Engineers Look at Foreign Cars

There's an aura of glamour about the foreign cars appearing in greater number than ever on our streets and highways. For a look beyond the glamour, *Popular Mechanics* editors interviewed a panel of three Detroit engineers and designers: William Graves, vice-president, engineering, and Edward Macauley, chief engineer in charge of styling, Packard Motor Co.; and George Walker, independent designer, who styled the current Ford line. The questioners were Arthur R. Railton, Automotive Editor, and Siler Freeman, Detroit Automotive Correspondent, *Popular Mechanics Magazine*

QUESTION: You have just returned from the European auto shows, can you give us a general impression for a starter?

GRAVES: To me, European cars fall into two distinct classes. First you have the standard production cars which haven't changed for 15 years. They have body panels, fenders and everything that they have had for 10 or 15 years. Then you have the sports-car class. At the Turin show, there were more sports cars than standard production jobs.

WALKER: That's right. For 20 years in this country we have gotten out of the sports-car feeling. We used to have the Jordan Playboy, the Stutz Bearcat, Mercer and the H.C.S., and some sporty looking cars, but that was before we had closed-body cars like we have now. Although the low silhouette of the European car is intriguing, very intriguing, and they

have the jump on what we call the sports car because they have spent more time on it, yet they haven't progressed as rapidly in a comfortable closed car as we have. I think from the design point of view, we designers are intrigued by something nice and low, snappy and zippy looking, but to take that car—even Ed's Abarth-Bertone, which I like—and stack that against a Packard or Cadillac or Lincoln, it wouldn't come off. American designers have worked for years to get a package which is comfortable, useful, dignified like a living room. The Europeans haven't. They still have to squat to get in the car, slide into it, and just sitting in the car, you get your clothes dirty. You get them wrinkled and if you try to put on a dress suit and go down the street—it's impossible. Even in my Continental it was tough, but in Ed's car, it is still tougher.

Q: Are we going to keep getting cars that are bigger and longer? Is there no market

for the small car in America?

MACAULEY: In my opinion the American public never will accept an undersize car. By undersize, I mean any car substantially smaller than the cars as we know them today and there is much proof of that. It has been tried so often without success.

GRAVES: Also I think it is fair to say that the cars aren't going to get any bigger either. We now have cars with an overall length that takes up most of the garages in use and I don't see that even our biggest cars can get much longer.

WALKER: I definitely agree with you on that. And you don't have to make them any wider because you have comfort now. Six persons can go from here to Duluth or to California and enjoy themselves. But we are bringing them down in height to give a new proportion. We are changing the riding location, which is now cradled, to give a shorter hood so you can get comfort without elongating the car any more. You don't have to have a long wheelbase like you used to, to get maximum riding comfort.

Q: Would you say they are going to get any shorter?

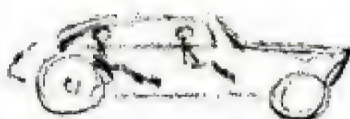
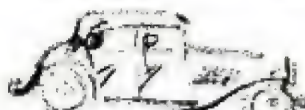
GRAVES: No. And I don't think we are going to see any change in front-seat width or front-seat legroom over what we have today. Packard seats are wide enough and there is plenty of legroom.

Q: There have been experiments in the United States with small cars, even to the extent where they have just a front seat and no back seat, just luggage space. These have invariably failed. Why do Europeans accept that and the American public doesn't?

GRAVES: I think it sums up largely to the fact that Americans are used to a higher standard of living than Europeans and it doesn't make any difference whether they are picking motorcars or homes or whatever. In other words, they won't put up with what Europeans do.

WALKER: I agree with that. We are not used to small cars. However, there is some demand for a small two-seater. It will be a special, and won't have the production of today's sedans. It does have a market. That is proved by the Jaguars and the MGs.

GRAVES: But I don't think Americans are ready to step down to a small automobile.



Walker sketched this to show evolution of the automobile

Q: Is there any reason for our desire for big cars except that we have always had big cars and we feel we should not retrogress to smaller cars? Aren't there inherent advantages in a smaller car?

GRAVES: I don't know any advantages in a smaller car unless you want to talk about economy, gasoline or tax economies. Certainly when a person buys an automobile, I don't think he is interested in that sort of economy. The American public has never shown it.

Q: You mean in operating expense?

GRAVES: That is right. People buy what they can afford to pay for and the smaller car isn't that much cheaper to build. For instance, we built experimen-

tally a small car. What was that wheelbase?

MACAULEY: That was 104.

GRAVES: Yes, 104-inch wheelbase. Well, we had the front wheels cut down. Our bearings were smaller and nonstandard. You could go out and buy a Ford bearing cheaper than we could buy the smaller bearing because Ford is tooled up for big production. Now of course that is not true all over. It didn't have as many pounds of sheet metal and that sort of thing, but there were so many things dependent upon tooling that you couldn't compete without volume. When you are tooled up, I don't think there is enough difference in cost for the public to step down to a small car.

Q: You wouldn't say that the ease of handling is anything to be considered, the ease of parking, the smaller area occupied on the highway, or any of these things?

GRAVES: They are offset by many things. First, small cars are noisy. They don't have a decent muffler. If you ride in many of the European cars you can't even hear the radio. Americans would rather have a heavier car steer harder than have to put up with a lot of noise.

When they do put exhaust pipes on, and cheap mufflers, they are built right up close to you. You use the transmission for an armrest, but who in the United States would want a transmission armrest?

WALKER: I think you have to give the engineers credit for a marvelous job in coordinating the interior of the automobile in this country. It is far superior to the European engineering. As you said, you don't get the noise here



Graves: "I think cars aren't going to get any bigger..."

and you coast along and look at the speedometer to find you are going 80 or 90.

MACAULEY: Can I elaborate on that a little? When I was in England I was driven by a friend in a beautiful example of a Bentley. The styling was strictly British, but it was beautiful coachwork and trim. Of course, it had an absolutely silent four-speed gearbox, but you had to do the declutching and all of that business we had been doing for years. I asked him what the car cost. He said, "This is \$12,500." The car just couldn't compare with our Packard Clipper, for example.

GRAVES: When Ed and I were at the Turin show, the companies had the streets closed off and a course to take you for a ride. We rode in the Ferrari, Mercedes, Lancia and Fiat.

Q: Are these all sports cars?

GRAVES: No. The Ferraris were, but the Lancia was a standard, the Mercedes-Benz and Fiat were standards. Those fellows would take you out and what would they do? All they would do is show you how fast they could accelerate in gear—and they shift them as Ed said—and the thing that dumfounded me above everything was that they would tell us they could throttle down to 10 miles per hour in high gear. We haven't heard that in this country for 15 years. They still want to be able to whip around corners like a racer. They take you down a street at 50 or 60 miles an hour, jam on the brakes and swing them around. It is really hot-rod stuff and I don't think the American public could be sold that way.

MACAULEY: They would scare the daylight out of us.

Q: You say then that probably most of the appeal of European cars in this country is to hot rodders? Or to those interested in performance rather than comfort and convenience?

GRAVES: That is right in that class of cars.

MACAULEY: Could we talk a little more about the sports car? As of the moment there has been a good deal of talk about an American sports car. You have heard about our Packard Pan American and one or two other American cars of this type. I think if we are honest with ourselves, the American public, let alone the Europeans, is not going to consider these cars as competition cars like the Mercedes or the



Macauley: "Americans never will accept an undersize car"

what they call competition performance.

Q: Are there any of these characteristics of a sports car that the family car can take with profit? Without sacrificing more than is gained?

MACAULEY: You have answered your own question. Not without sacrifice of handling, rideability, comfort, dependability and all those things.

Q: Isn't weight distribution a problem today? The trend has been to take weight from the rear wheels and put it on the front wheels. That means slower steering because you have to increase the gear ratio, does it not?

MACAULEY: George mentioned a while ago, we moved the passengers between the axles and to do that, in many cases, the engine is way over the front suspension.

Q: Is slower steering good?

MACAULEY: Slow steering is good for the lady in maneuvering and parking the car. She couldn't do it without the 22 and 23 to 1 ratios.

WALKER: I think the demands of the women handling cars have forced engineering to go to power steering.

Q: Should we adopt any of the characteristics of sports-car suspension to make the family car safer on turns?

GRAVES: I don't know that we can answer that quantitatively, but perhaps the thing that causes accidents on turns is that people just don't realize the speed at which

they are traveling in these quiet, smooth-riding automobiles and they come up to a turn at too great a speed. But as an offset to that, the driver is rested. He isn't tired. His faculties are available to him more than if he had a car that tired him out with all that noise and clatter.

Q: Are you saying then that the relaxing ride contributes to safety rather than takes away from it?

GRAVES: We certainly

(Continued to page 302)



Walker: "We sell comfort—a living room on wheels..."



Sports-car winner was this Mercedes-Benz driven by Karl Kling. Average for 1933 miles was 102 miles per hour



THE MEXICAN ROAD RACE

By Thomas E. Stimson, Jr.

FROM NOW ON, don't let any sports-car fanatic tell you that your stock automobile is a clumsy heap that can't get out of its own way or go into a corner without flipping over!

November's Mexican Pan-American Road Race from Guatemala to the United States changed all those ideas. The results of the international contest, now being analyzed, show that American stock cars are far better vehicles than many people supposed.

The race was divided into divisions for sports cars and for stock cars, yet at some of the control points the five-minute interval between the groups had to be lengthened to a 15-minute delay simply to prevent the fastest stock cars from overtaking the slowest of the sports jobs!

Here's the picture: The course is the central highway that slices up through the

middle of Mexico. Starting at Tuxtla near the Guatemala border, the cars raced north in a series of one-day laps and finished at Juarez, across the Rio Grande from El Paso. Distance: 1933 miles. Altitudes: From just about sea level to as high as 10,380 feet. Road conditions: A good paved highway with everything from 20-mile straightaways to tortuous mountain grades full of blind hairpin turns.

It's the toughest race course in the world and runs from the tropics to the temperate zone through jungles, deserts, fertile valleys, mountain ranges, cities and towns. It's such a supreme test of cars and drivers that the Daimler-Benz (Mercedes) factory of Germany and the Ferrari factory of Italy each groomed special teams for the contest.

There were 28 starters in the sports division, including the Mercedes and Ferrari



Winner in the stock-car class was the Lincoln shown here. Driver Chuck Stevenson averaged 91 miles per hour

cars, a pair of 160-horsepower Gordini machines from France, rear-engined Porsche cars from Germany, supercharged Lancias

from Italy and Jaguars from England. In the race's stock-car division there were 64 starters of 11 different makes including a little Henry J that went all the way, averaging about 70 miles per hour. Eighteen sports cars and 35 stock cars failed to finish, smashing up or breaking down during the contest.

In the sports class it was strictly a race between the 6-cylinder, 173-horsepower Mercedes cars and the 12-cylinder Ferrari "Mexico" machines (over 220 horsepower). The Germans had tire trouble until they cut body scoops to admit cooling air, then they deliberately trailed the Italians until most of the mountains were left behind. One Ferrari was wrecked en route, some of the others had mechanical trouble. When the race ended, the Mercedes team had won the first

Spectators lined the route. Special trains were run from Mexico City to vantage spots





Winner Karl Kling installed bars on his Mercedes to prevent low-flying buzzards from smashing windshield



Drivers were required to use both safety belts and crash helmets. This man also wore shoulder harness



Most stock cars had roll bars behind the front seat to strengthen the roof should the car overturn



Getting a fast tune-up at a control point is Chinetti's Ferrari that finished third in the sports-car class

Air scoops on the wheels helped to keep brakes cool



New tires were mounted and wheels balanced nightly



two places, the Italians ran third.

Karl Kling, in the leading Mercedes, averaged a terrific 102 miles per hour for the whole race. This was a fantastic speed and yet Kling was less than 2½ hours in front of the fastest stock car, a 1953 Lincoln that averaged 90 miles per hour for the entire distance.

The two cars were surprisingly close together, considering that the low-slung Mercedes was designed and built for road racing while the Lincoln is basically an ordinary family sedan. And to show that the Lincoln's performance wasn't a fluke, three other Lincolns and a Chrysler were only minutes behind it. Then came another Chrysler, a Hudson and a Cadillac. The fastest Lincoln, driven by Chuck Stevenson with Clay Smith as co-driver, made better time than did four of the European sports cars. The Lincoln was actually three miles per hour faster than the winner of the sports division the year before.

The performance of the stock cars is even more striking when their weight in relation to horsepower is considered. The 173-horsepower Mercedes weighed about 2300 pounds with driver, co-driver and fuel. The Lincoln is rated 205 horsepower, yet weighed close to 5500 pounds at the starting line, loaded with crew and extra fuel. In spite of this weight handicap, the average speed of the Lincoln was only 11 miles an hour less than that of the fastest Mercedes.

These comparisons aren't made to detract from the remarkable performance of the sports cars but



Mercedes roadster stops at a control. It finished fourth but was disqualified because a mechanic worked on it during a lap



Engine of the Mercedes is tilted to one side to lower the overall height and center of gravity. It develops 173 horsepower

One of the 35 stock cars that didn't finish was a Hudson from Mexico that rolled over on a curve. Race had one fatal accident





Top, typical stretch of level road. Car 149 finished fourth and was driven by an American Air Force captain

simply to point out that stock automobiles, too, are exceptional vehicles in the hands of skilled drivers.

Strictly speaking, all the stock cars in the race were modified to some extent, though engines were not souped up to deliver more than their rated horsepower.

To understand these modifications and to learn the secrets of fast road speeds, let's consult Clay Smith, who was co-driver of the leading stock car. Together with Bill Stroppe, Smith managed and directed the three Lincolns that placed one, two and three in the stock-car division.

"The stock-car rules," Clay says, "allowed the use of factory-optional equipment and, for safety, permitted brakes, shocks and suspension to be modified. Special tires and rims could be used. An additional fuel tank was permitted, as was an interior roll bar to protect the crew if a car rolled over. Driver and co-driver had to wear helmets and airplane-type safety belts.

"The changes that we made to the Lincolns consisted of installing heavier springs, a heavier sway bar and special shock absorbers. These parts are available in the so-called 'export kit' that fits a car for rough roads. Their effect in the race was to stiffen a car so that turns could be made at high speed with little swaying or skidding.

"We installed an optional camshaft in the engine and optional mechanical valve lifters in place of the hydraulic type that tend to float at high engine speeds. We retained

the standard four-barrel carburetor, the stock Hydra-Matic automatic shift and the standard rear-axle ratio. An extra fuel tank was mounted behind the front seat of each car, bringing the total capacity up to 62 gallons.

"All three cars delivered perfect mechanical performance from border to border."

Tires are a critical item in any long road race. The heat of high speed and the pull of the car on corners can virtually disintegrate any ordinary tire. One stock car that used premium and first-line tires had 33 tire failures before it went out of the race. On the Lincolns, Smith mounted tires that are designed especially for road and dirt-track racing. They gave a minimum of trouble. Only one tire among all three cars was changed on the road, though other changes were made during the stopovers at the end of each day's run.

For the last, almost-straight stretch from Chihuahua to Juarez over which the leading Lincoln averaged 114 miles per hour, Smith purposely used worn tires on the front wheels of the team. The tire treads were well scrubbed in, he says, so that they held well on the corners. Being thin, they retained less heat and hence were safer than thick tires so long as they encountered no sharp objects.

Brakes, similarly, have always been a problem when racing through the mountains of Mexico. Some of the cars changed

(Continued to page 298)

Can You Identify Them?

Once upon a time all taillights looked like the one on the Model T at left. Today, in shape and size, they reflect each car's personality. Here are some of the 1953 models. How many do you know? Answers are at bottom of page



1 _____ 2 _____ 3 _____ 4 _____



5 _____ 6 _____ 7 _____ 8 _____



9 _____ 10 _____ 11 _____ 12 _____

ANSWERS: 1 Hudson; 2 Oldsmobile; 3 Ford; 4 Plymouth; 5 Buick; 6 Packard; 7 Lincoln; 8 Mercury; 9 Dodge; 10 Cadillac; 11 Kaiser; 12 Pontiac

ANTIQUES ON PARADE

...THE GLIDDEN TOUR



On parade in Washington, the 212 antique cars roll in front of the Capitol. A rare 1906 six-cylinder Ford leads the parade. Behind it is a 1906 Buick

By Richard F. Dempewolff

Photos by Maggi

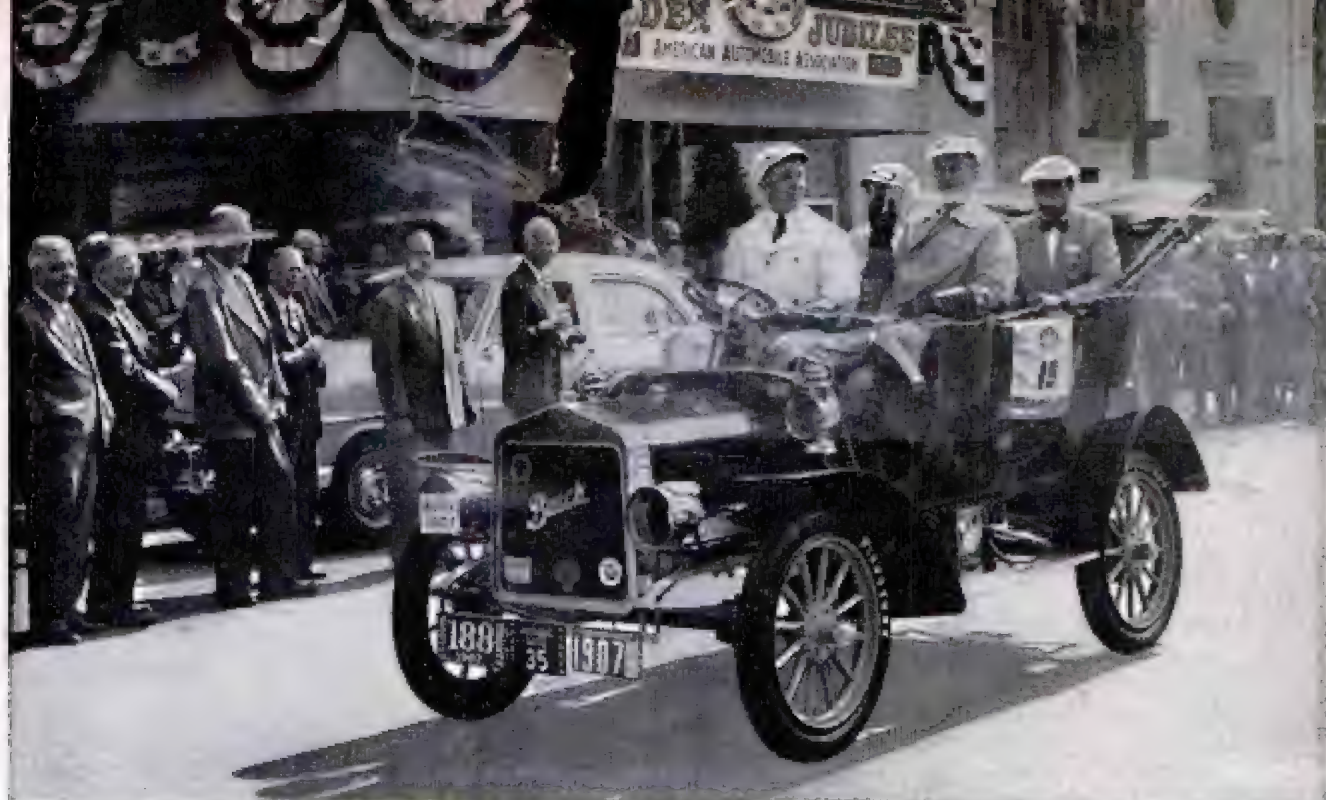


DOWN THE PIKE from Harrisburg to Washington they chugged, 212 strong. Among them were Mercers, Ramblers, Duryeas, Empires, Chadwicks, Regals, American Underslugs as well as a dozen different breeds of steamers. The whole colorful parade took place when antique-car owners converged on Harrisburg in the annual revival of the Glidden Tour.

At Harrisburg they joined forces to stream down the road to Washington for a grand-climax parade along Constitution Avenue to the Capitol. To old-car lovers, this junket is the high point of the year—a colorful revival of the tours originally conducted from 1905 to 1914.

At first, the tours were organized to prove the automobile a trustworthy vehicle. In 1905 Charles J. Glidden,

Among the classic antiques was the handsome 1910 American Underslung driven by Briggs Cunningham. It was designed by Harry Stutz



Past AAA headquarters rolls Stuart Goddard's 1907 two-cylinder Buick. Right-rear passenger is the author

a wealthy New England industrialist, offered a \$2000 cup to the newly formed American Automobile Association. It was to be competed for by touring cars on a rigidly controlled endurance run. Contestants started with a perfect score, but collected penalty points for breakdowns, punctures, falling behind or running ahead of schedules that called for legs of 70 to 125 miles a day. The lowest score won the cup.

The first Glidden Trophy tour sponsored by the AAA was an 870-mile jaunt from New York City on rutted wagon trails to Bretton Woods, N. H. By 1914, the tour had proved what it set out to prove—the horseless carriage was here to stay. The 1914 tour through the West and deep South ended the series. Of the 23 entries, all came in on schedule—seven with perfect scores!

For years the tours remained a memory.

Then collectors began refurbishing the old cars that had been gathering cobwebs in barns all over the country. The Veteran Motor Car Club, the Antique Automobile Club and the Horseless Carriage Club were formed. In 1946, M. J. Duryea, son of the pioneer automobile manufacturer, began to organize a revival of the Glidden Tour, and a year later in cooperation with the AAA and the old-car clubs, the tour came back into being.

Today owners of restored ancient cars spend months tinkering, painting and polishing acetylene-lamped chariots in preparation for the big event. Rules are rigid. Emphasis is on antique steam, gas or electric cars of Glidden Tour years or earlier.

Certain later models, called "vintage" cars, are also eligible. As in the early days, each driver starts with a perfect score,



Winner of the big AAA cup, this 1915 Crane Simplex has six cylinders. Its price when new: \$33,000



Another prize winner was the 1903 one-cylinder Oldsmobile roadster. It has a wicker front and back and a steering tiller. Passengers in the rear seat are facing backwards

adding points for breakdowns and delays. Primary consideration goes to mechanical condition and performance; paint, upholstery and brasswork come second. Prizes go to the oldest car in each category completing the trip; to the tour-age car traveling the farthest; to the best cars in various cylinder categories; to the most typical tour-age cars; and so on.

The 1952 Glidden Tour was a combina-

tion of many tours. Converging on Harrisburg from 11 starting points that included Chicago, Detroit, Springfield and Boston, Mass., and New York City, the 212 entries set out in teams of 3 to 10 different-make cars so they could help each other in case of breakdowns.

Typical of the groups heading for Harrisburg was a five-car team from Worcester, Mass., led by Sully Garganigo in a one-

With the Capitol as a backdrop, a 1911 Cadillac proves that straightforward sport-car designing isn't new!



cylinder 1900 DeDion-Bouton museum piece. Behind him, young Bob Schonborg drove his canary-yellow 1905 Binford Special, a bucket-seated, topless vehicle with chain drive and two whopping five-inch-bore cylinders that thumped away like a heavy-duty compressor. In a shiny blue 1909 Buick, studded with brass and undercoated in red enamel, came Ted Lysik and his wife. This was a real car with four cylinders that knocked out 18 horsepower. Weaving in and out, sometimes behind, sometimes ahead, roared two peppy 1909 Model-T Fords piloted by Ted Rivers and George Antronnella. The little motorcade, looking like an advance guard for Barnum and Bailey, shuddered along under full throttle at 10 to 30 miles per hour, depending on which way the hills sloped.

Garganigo's 1900 DeDion with its genuine patent-leather fenders was the oldest car in the entire tour and it popped along on its one-cylinder at an average 20 miles per hour. Built in Brooklyn under French patents at the turn of the century, the car has its engine under the seat. The driver steers with a brass tiller. On long trips, Garganigo substitutes a wheel for the tiller. A folding jump seat facing the driver accommodates a third passenger and gives the car its model name, "Vis-a-vis."

Like all antique automobilers, Garganigo likes to point out the modern features of his ancient hack. "Detroit thinks it has something," he says. "Here's this thing 50 years old and it has a planetary shift, geared rear end, tubular-steel chassis and, by gosh, the gear-shift lever is under the steering wheel."

No one's in a hurry on a Glidden Tour — from necessity. In towns, people gape from the curbs, jeer and shout. Drivers yell back and toot Klaxons at pretty girls. Frequent stops are made along the road to tighten bolts, oil creaking bearings, adjust slipping clutches or ignition

(Continued to page 292)



Above, more than a dozen different makes of steam cars were in the tour. One of the most interesting was the 1903 Grout steamer owned by James Beun of Quakertown, Pa. Extra passengers in this sporty car sat down front where the scenery and breeze were best



Sully Garganigo takes down the slipping clutch on his snappy DeDion Bouton with patent-leather fenders. The complete clutch job took 15 minutes! This is a 1900 model, oldest car in the 1952 tour. Below, now is the time for spectators to yell "Get a horse." Ted Rivers cranks his 1909 Model-T Ford, with its Non-Skid tire tread





Gas tank

Gas went under front seat; a stick was the gauge. The "T" had no fuel pump



Windows

Photos courtesy The Henry Ford Museum

When it rained, curtains with isinglass inserts had to be stretched into place. Windshield wiper was hand powered



Starter

Crank was standard. The choke wasn't automatic; nor was the spark control



Engine

Carburetor had only one jet and no air cleaner. Engine had no oil pump either



Dashboard

Dash had ammeter, light switch, lock. Choke and mixture control is at right

Front-wheel suspension: A kingpin and that's all. Lubrication was by oil cups



Suspension



1922

The Old

IN 1922, Henry Ford built 1,351,333 Model-T Fords and sold them for \$660 each. For that \$660, you got 20 horsepower, a 45-mile top speed, a mysterious device called a magneto and a grinding two-speed transmission that you shifted with your feet. The car had no fuel pump, water pump or oil pump, no starter or spare tire (both extra-cost items). In fact, it was



Doors

The T had only 3 doors, (none for the driver), no outer handles

Worm's view of engine oil pan, transmission and steering linkage. The V-shaped part is the Model T's famed wishbone

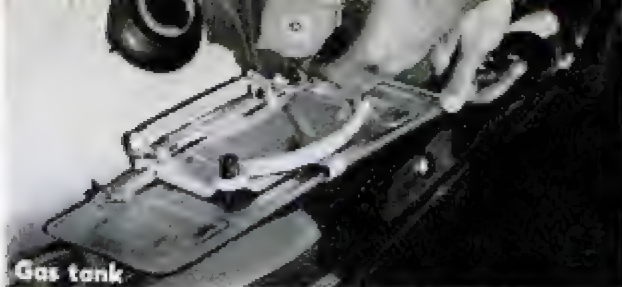


Chassis



Windows

Rain and cold don't bother today's drivers. Windows keep out weather. Power wipers keep curved windshield clean



Gas tank

Today's gas tank fills at center rear. By the way, the T had no trunk either!



1953

The New



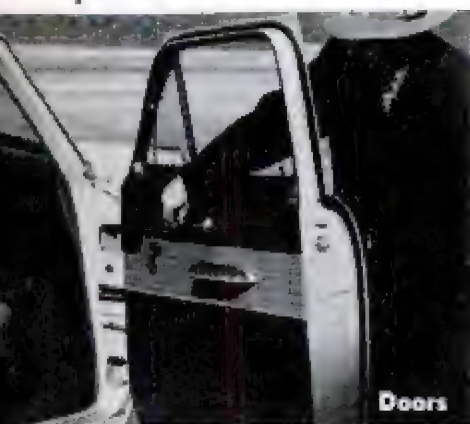
Starter

To start the new Ford you simply turn the key. Anybody seen a crank lately?



Engine

There are 110 horses in the V8; only 20 in the 1922 four-cylinder engines

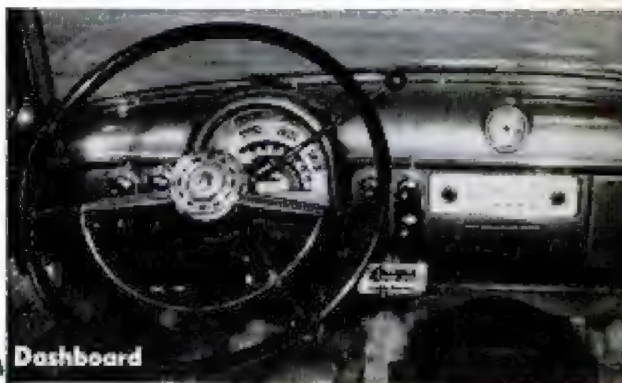


Doors

Large doors with lush upholstery and hardware are now standard

little more than the simplest machine that would haul you around in a reasonably reliable manner. Today, the Ford V8 or any of its competitors sells for about \$1700 (plus taxes). For that price, about 2½ times as much, you get many times more of everything. One small example: The "T" had three lamp bulbs; today's car has just ten times that number! ★ ★ ★

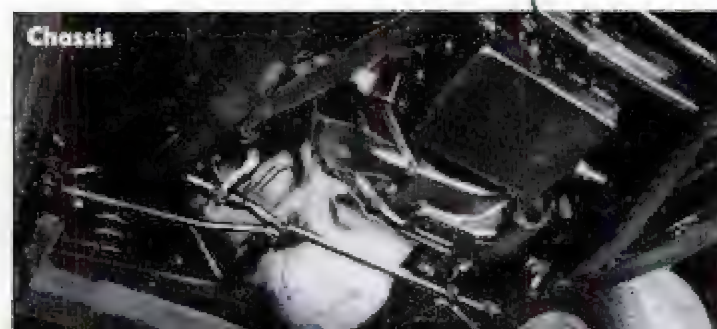
Box frame is sturdily cross-braced. Steering is easier, but slower than on T. Automatic transmission is optional



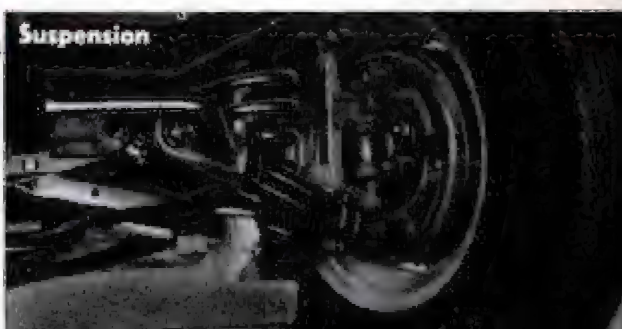
Dashboard

Instruments now help you drive safely. And the T's unique foot shift is gone!

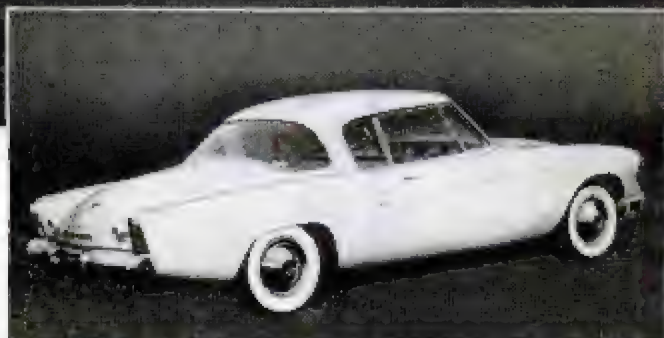
Front wheels are independently sprung and have brakes, which the T did not



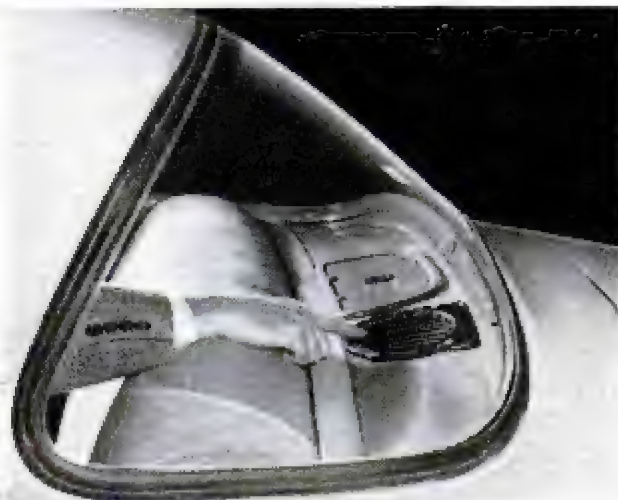
Chassis



Suspension



Top, although it looks like a custom car, this is a regular Champion hardtop production model. Its downward-tapering hood ends in a clean, simple grille. Above, fin-type rear fenders add to the sleek look



Defroster (optional) keeps the big back window clear

Permanently built into the center of the rear seat is an armrest that opens to become a glove compartment



Studebaker Sparks '53 Line With Its Sleek Sportster

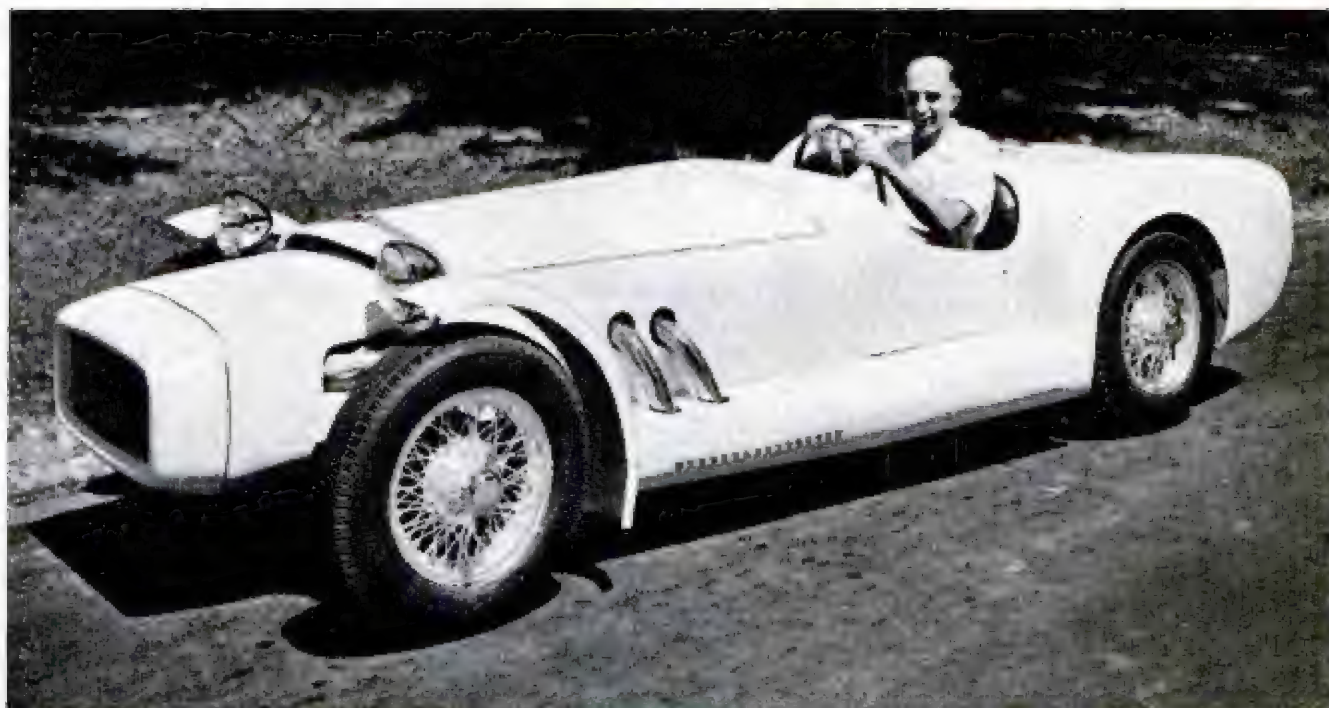
BACK IN 1947 Studebaker started a trend in automobile design when it introduced its Raymond Loewy model. So different was its style that jokes about the car not knowing which way it was heading were as common as radio comedians.

Now after five years of face lifting on that design, Studebaker and Loewy hope to start another trend with the 1953 line of sleek sports or hardtop models. Different from the regular series (see page 112), this line is available in both Champion (six-cylinder) or Commander (V8). It is wider, longer and lower than the standard models.

Most noticeable characteristic of the hardtop is its extremely low appearance. Interior room has not been sacrificed, although headroom is slightly less in the rear seat. Rear floors have been recessed to increase seat height. Concave side panels on the doors are an innovation in U. S. styling. The hood tapers downward sharply to emphasize the car's speedy look.

Because the rear deck is so low, the spare tire is carried flat. On the "family" model it is vertical





American Sports Car Designed for Mass Production

Capable of being mass-produced for \$2000 is an American sports car developed by Brooks Stevens, internationally known industrial designer. Stevens has produced three hand-built models of the Excalibur J for less than \$3500 each, and hopes to interest large manufacturers in the automobile. A 100-horsepower car weighing 1500 pounds, it is constructed on a standard Henry J 100-inch wheelbase. In two of the three models Stevens has installed a Willys F-head six-cylinder 90-horsepower engine which has been boosted to a 100-horsepower

equivalent by exhaust modifications. The third car is powered by an Alfa-Romeo six-cylinder, 100-horsepower twin overhead-camshaft engine. In the Excalibur J are unorthodox combinations of classic foreign sports-car design and American styling. The car has a huge, ornate air scoop in front complemented by a secondary air intake back of the hood which furnishes clean air directly to the combustion system. Geared to a top speed of 120 miles per hour, the Excalibur J can cover a quarter of a mile in 15 seconds from a standing start.



Snagproof Zipper Detaches When Clogged

Nonjammable, a steel Zipper easily snaps open to free snagged clothing. The fastener, which is opened by pressing back its handle, is then refitted on the base of the track and snapped shut. It may also be used to replace a standard fastener that is jammed, eliminating the cost and trouble of sewing in a new unit. The product is manufactured in 80 colors.



Folding Auto-Snack Tray

Permanently installed in seconds on the interior side of a car door, a folding tray holds food and drink for quick snacks. A hooked tongue which slips under the window molding of any car secures the tray. When not in use, it folds completely out of the way. A wire frame prevents a cup or bottle from spilling its contents.

Adjustable Plastic Safety Filter Reduces Headlight Glare



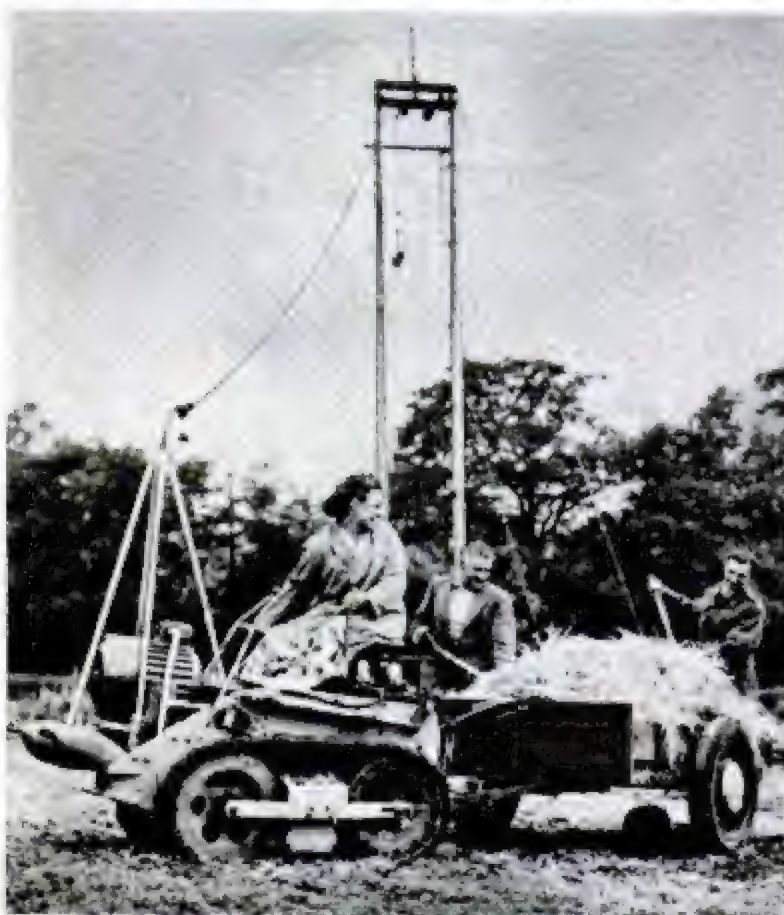
Relief from a chief nighttime-driving hazard—the glare of oncoming headlights—is furnished by a contoured plastic filter which adjusts to the driver's eye level. Mounted on a stainless-steel rod which fastens to the left corner post, the filter is easily raised or lowered to the proper height for any driver. The filter, made of acrylic plastic, is specially selected for its free transmission of color and line. It cuts glare without harming vision. The unit is quickly installed on any car or truck.

Bottled-Gas Lamp Produces Infrared Rays for Military Use

Bottled liquid petroleum gas instead of electricity is the power source of an infrared lamp developed for military use. Lighter, because it has no batteries, the five to ten-pound device is just as bright and is not affected by extremes of heat and cold. A knitted rayon mesh, impregnated with salts of chromium and aluminum, forms the

mantle. When lighted, the rayon burns, leaving the oxides of the two metals in mantle form. The invisible infrared rays are of the type used in wartime in beacon lights to control road blocks, for taking secret photographs of enemy installations, and in sniperscopes which enable sentries to pick off enemy prowlers in the dark.

Electric Tractor Uses Trolley-Type Cable to Reach Power Supply



Connected by cable to its power supply, an electric tractor for small plots and gardens is a cross between a city streetcar and a farm implement. Electric cable fed out from the wooden pylon in the center of the garden is kept taut by counterweights which allow the machine to move about freely without getting tangled in its own line. The tractor, with just a simple electric motor for an engine, is reportedly cheaper to run, needs less care and is more powerful for its size than standard models. Invented by Russian mechanics, the electric tractor is now being tested in England.

Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge from Bureau of Information, *Popular Mechanics*, 200 E. Ontario Street, Chicago 11

"Singing" Safety Lanes Provide Warning for Motorists

Pavement edges that "sing" a warning when motorists veer too near the side of the roadway will border north and south lanes of the proposed Garden State Parkway in New Jersey. Three-foot strips of corrugated concrete which cause a humming sound when driven over will be a safety feature of the 165-mile expressway. The corrugations act as reflectors for increased visibility both day and night. The tooled strips are also being used on other New Jersey highways for reflecting curbs and as a replacement for the center line in two-lane roads.



Calculator Results Are Automatically Printed by Typewriter



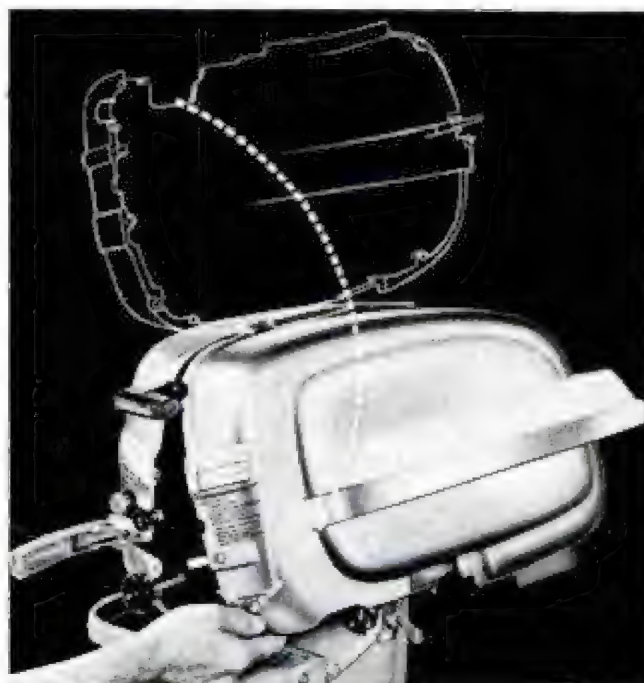
Keys punched on a calculating machine print the results on an electric typewriter by means of an electronic device connecting the two machines. The computing attachment, an outgrowth of research done on the ultrasonic homing torpedo, has automatic control circuits. Attachment of the device requires no alteration in either machine. The device is said to increase calculating speed by 40 percent, as transposition of figures can be detected instantly and the results can be checked quickly.

Outboard-Motor Auto-Lift Hood

Unsnap two sturdy clasps on a new outboard motor and the entire port side opens to a vertical position. Easy to open as the hood of a car, it will also stay open by itself. It provides easy accessibility for inspection and routine servicing.

Transparent Wound Dressing

Sprayed from an aerosol bomb, a transparent, flexible-plastic dressing for burns and other wounds lets the surgeon see how the injury is healing. The substance keeps out germs, is said to be more comfortable than pressure dressings, and eliminates the need for any kind of bandage. Since it adheres only to dry, healthy skin areas, the plastic can be peeled off without injuring the wound.





WHAT'S NEW FOR Your Home

1. WALLPAPER SQUARES make it possible for novices to redecorate in a professional manner. Because the pretrimmed squares are small enough to handle with ease (14 by 14 inches), there's no trick to hanging them. A special advantage is that damaged squares can be replaced without re-covering the entire wall

2. BOTTLE-CAP GRIP made of rubber expands to fit a wide range of cap sizes; enables you to unscrew stubborn bottle and metal-container caps in a jiffy. Stored in the bathroom cabinet, dressing table, kitchen or workshop, the grip saves time, trouble and eliminates danger of broken bottles and cut hands

3. REMOVABLE DOOR on range lifts out easily for cleaning, permits unhampered access to back and sides of oven. Broiler drawer which contains a pan holding a large steak or up to nine pieces of toast slides out when a toe pedal is depressed. Side storage cabinet features pop-out wire basket

4. SHOPPING REMINDER lists over 40 household necessities. Red pinheads, held in place by spring tension, are moved from the back of the rim to the front, sliding into slots opposite the desired items. Small enough to be slipped into a purse, the plastic disk ends searches for pad and pencil, saves tempers

5. THREE-SECTION SKILLET enables you to cook three different foods at one time in the same pan. Made to order for bachelors and campers, the pan saves fuel and extra washing, is also useful for warming up leftovers and baby food. The skillet is large enough to hold complete meal for one person





6. SWINGING TRAY hinged to side of bed pivots into place for convenience of bedridden patients and midnight letter writers. Eighteen inches in diameter, the molded plywood tray is supported by a metal arm which can be locked at any position in the arc. Satin-chrome finish blends with almost any color scheme



7. TABLE-TOP OVEN bakes and roasts like any large unit, but saves space and uses less current. It resembles an electric hotplate, but is larger and is equipped with pans, covers and accessories which enclose the top and convert it into a miniature oven. With cover removed, it can be used as a griddle

8. AUTOMATIC CLEANER for flush toilets keeps bowl sparkling clean, ends unpleasant brushing chore. A small jar holding a bag filled with cleansing chemical is installed inside supply tank. Water which flows from the little copper tube into the overflow pipe to fill bowl after flush detours through device



9. TRAY ATTACHMENT converts standard dining-room chair into a high chair. Three short legs rest on chair seat, supporting food tray and side arms. Leather straps secure attachment to chair back. Adjustable to fit large or small infants, it's also light, portable, folds to fit small carrying case

10. LAMP UNIT converts bottles, jugs and vases into modern three-way electric lamps. Bulb socket is fitted into a cork base which is supplied in three sizes to accommodate large or small openings. Snug fit is obtained by peeling off surplus cork. Side cord outlet eliminates drilling or need for tools



Mobile Unit Gives Auto Radiator Quick Test

When a car engine overheats and a plugged radiator is the suspected cause, there's no need to remove the radiator for

checking if a mobile testing unit is used. Water drains through the radiator by gravity,

is collected in a pan beneath the car and then returns through the machine back to the radiator inlet. Rate of flow indicated on a gauge is compared with a table of factory flow standards on various makes and models of cars. If gallons-per-minute flow is 20 percent below standard, the radiator needs cleaning, removing a probable cause of overheating. Testing time is two minutes or less. The machine plugs into any convenient electric outlet and carries its own water which is recirculated after use.



Sunspots May Be the Principal Cause of Warmer Weather

Tiny particles, hurled at the earth by the sun when sunspots erupt, may cause warmer weather. That's the opinion of Dr. H. C. Willett, professor of meteorology at Massachusetts Institute of Technology, who believes that the warming up of the Northern Hemisphere during the last 40 years is a result of this activity. Sunspot activities and the subsequent arrival of particles in

our higher atmosphere are followed by a warming of the upper altitudes and immediate changes in the weather on the surface of the earth, he says. As partial evidence he notes the relative warmth of Arctic winter temperatures during the period of strong solar activity from 1945 to 1950 and the rapid melting of glaciers during the heights of sunspot activity in 1917 and 1937.

Truck Lift Transports Fishing Boats to Water's Edge

When fishing boats are to be moved out to the water's edge during low tide, Crawford Johnston of Double Bluff on Washington's Whidbey Island has a quick solu-

tion. He scoops them up on a portable lift he constructed on a war-surplus truck and hauls them down to a suitable launching spot. The operation takes but a few minutes.





THE MAKING OF A

By Jack B. Kemmerer

SAILMAKING is a fine art and an ancient one. Many people know of it, but very few know about it. The average amateur, after his first attempt, will find that there is far more to making a sail than sewing a few strips of canvas together.

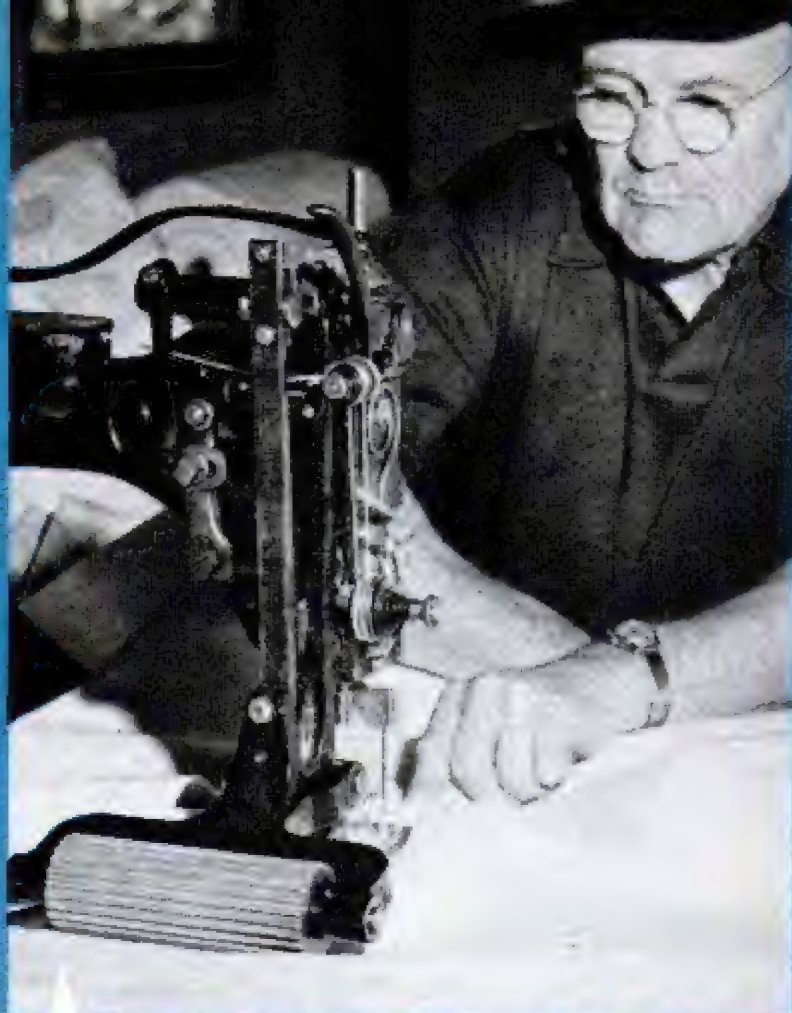
The earliest attempts of primitive man at shipbuilding probably took the form of

coracles (small boats made by covering a wicker frame with hide). Egyptian drawings, dating about 6000 B.C., show boats constructed of planks and having sails as well as oars. By 340 B.C., the ship had become a scientific vessel and possessed a carefully thought-out rigging and sail plan.

All sails used on yachts and small boats



Veteran sailmaker studies the sail plan for a 162-foot schooner preparatory to designing a new tailored mainsail and jib



Heavy-duty sewing machines handle all the large work in sailmaking today. In the old days all sails were hand-sewn, but the cost of a hand-sewn job now is prohibitive



All seams of the sail are triple-stitched, first by a double-needle machine and then by a single-needle machine. This eliminates repeating the operation on other side of sail



Headboards, bolt rope, rings, sail slides, jib snaps, etc., are sewn by hand into a sail





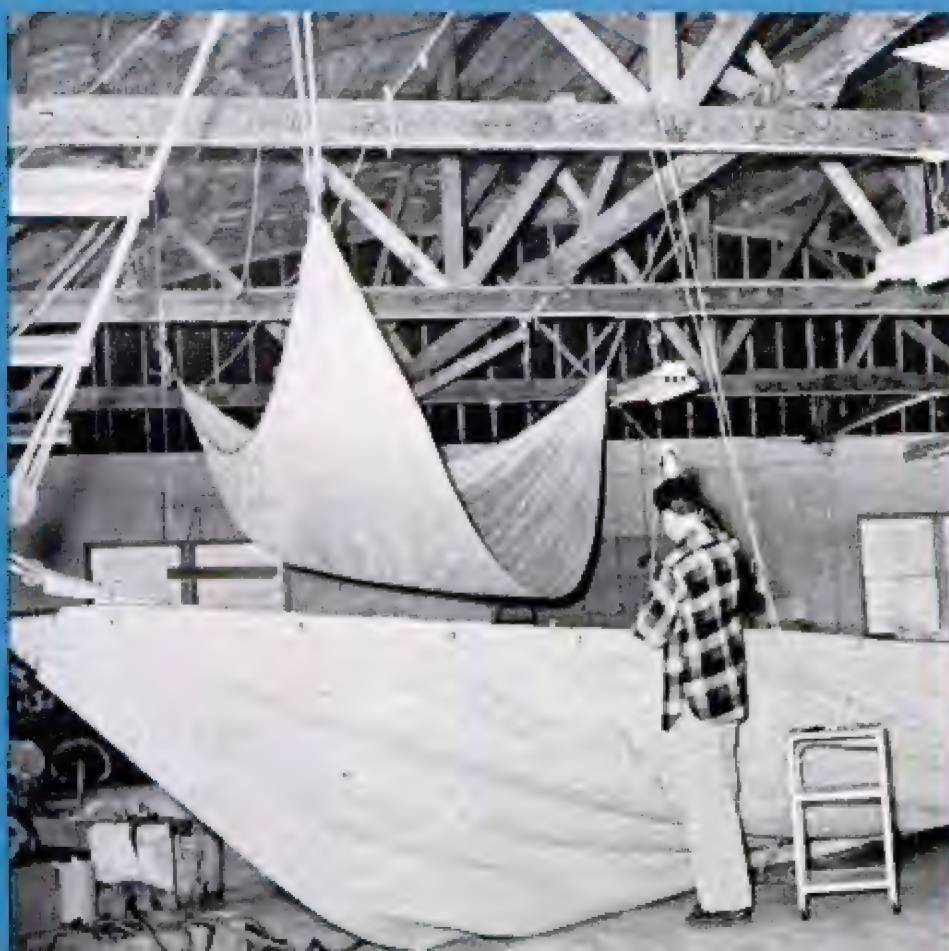
Corners and head of the sail are reinforced by patches. Here a corner is being measured and the patch cut to fit. Right, when sail is sewed it is laid out on floor of sail left



today are made of cotton. In the old days, sails were woven of flax which was soft and made a baggy sail but was easily handled and furled when wet and heavy with salt. Heavy cotton becomes stiff and hard to handle when it is wet. Today, in China and among savages, sails are, in quite a few in-

stances, made of grass-and-fiber mattings.

The most important change in modern sailmaking was the switch from flax to cotton duck. Previous to 1836, sails in this country were made of Russian or Dutch flax canvas. Cotton sailcloth was an immediate success because it holds its shape



Sail is "roped" with stainless-steel wire. This is a hand-sewing operation. Below, sail-maker's palm is made of an extra-heavy leather





All sail twine that is used in handwork is thoroughly waxed first. Otherwise, the sun, wind and rain would soon rot sail's seams

Heavy Manila rope is hand-sewn along the foot of the sail. The sailmaker's bench holds all the tools of his ancient trade

far better than the flax canvas once used.

Even though cotton duck for sails is manufactured under rigidly controlled conditions, it is a fabric and must be treated as such. It is elastic to a certain degree; stretches with a hard pull; shrinks when wet; distorts if pulled on the bias, and will mildew if stored in moist places—unless specially treated.

There are no substitutes for experience in sailmaking. The art is based on many years of actual experience in working with a particular cloth. Cotton duck varies greatly in characteristics, even between brands of the same quality. The pictures on these pages follow a sailmaker through his loft in making a large mainsail and show many of the intricate steps required.

When completed, a solution is sprayed on the sail to make it mildewproof. This is a protection when stored wet on hot days

Handwork is sewn around clew iron in the corner where luff wire and rope meet





Two sailors get ready to hoist a new jib sail on a large yacht. The sail must be broken in

Fruit of the sailmaker's laborious job is the sight of a sailing yacht with its sails set into the wind and headed for the sea. Safe sailing is assured by scores of careful measurements and many canvas strips held by millions of stitches

The sailmaker's job may be finished but when a new sail arrives on board a large yacht there is much work to be done by the crew. This new jib sail was tailor-made for the boat



Plastic Die Takes 100-Ton Pressure to Form Truck Panels



Made of plastic instead of high-alloy steel, a die used to shape major steel panels for trucks withstands the tremendous pressure of a standard 100-ton press. Only one fourth as heavy as the customary die, the 1500-pound plastic form is reinforced by a boxing made of boiler plate. The die is of a type used successfully by the aircraft industry. Only three weeks, instead of the customary 14 to 16, were required to produce the test die, which required no machining after it was formed.

Space Travel Poses Knotty Problems for Future Voyagers

When scientists have licked the problem of getting man off the earth and into space, they'll still face difficulty in keeping him there—alive, that is. Spaceship and satellite designers will encounter a host of tough problems. Dr. Wernher von Braun, inventor of the German V-2 rocket during World War II, outlined some major difficulties.

Men must breathe or die, so some kind of air-refreshing apparatus must be in-

cluded to supply oxygen during the weeks or months a space trip may last. Moderately large meteors could puncture the hull of a high-flying ship easily, causing immediate explosive decompression of the crew. If the rocket's cooling system failed, inside heat caused by air friction against the hull would quickly kill rocket operators.

Even while the ship was leaving the earth's atmosphere, it would encounter cosmic rays and ultraviolet light dangerous to unprotected humans. Informed guesses place the floor of this hazard area 13 to 23 miles above the earth. And weightlessness would occur when the ship reached an altitude of 50 to 60 miles, causing queer kinks in the human anatomy. Even the smallest details of ordinary living become posers in weightless space. How are you going to boil anything if the water won't stay in contact with the bottom of the pot? What do you do with the garbage?

If the ship runs into trouble, rocketmen will need to leave it hurriedly and safely, probably in cylindrical, self-sealing containers that can be ejected from the ship.

Directional change when there is no thrust operating is another problem. One solution would be flywheels set at right angles to each other, powered by small reaction motors. Other standard equipment will include navigational instruments, altimeters and speedometers capable of measuring speeds of more than 10,000 miles per hour, long-range radios to keep in touch with Earth, electric motors that can operate in a vacuum without air cooling and perhaps a solar-energy plant to gather heat and energy en route.



Space suit proposed at international meeting of scientists leaves no part of the body unprotected

Earthquake Fighters Rebuild a Railroad



Over 250,000 cubic yards of earth were moved to build a temporary by-pass around a quake-blocked tunnel

LAST SUMMER the second-most-powerful earthquake in its history ripped across southern California. By a great act of Providence, the full tearing force of the shake was confined to a lonely mountain area, 142 rail miles north of Los Angeles. Fourteen persons were buried in the rubble of the town of Tehachapi.

The greatest single loser, in terms of property damage, was the Southern Pacific lines. By some uncanny, frightful freak, the full, grinding twist of the shake was concentrated in Clear Creek Canyon,

where four tightly spaced railroad tunnels carry the tracks in an uphill twist around the walls of the canyon.

The spot is important to both the Southern Pacific and the Santa Fe railroads, which share the trackage. The damage was actually greater than if a carefully worked out enemy air attack had blasted the area. The rails had to be restored in order to resume the steady flow of defense goods pouring out of southern California.

For 25 days trains were rerouted over to Southern Pacific's coast line.

Some trackage was uprooted and other sections, where the ground dropped sharply, were left sagging over space





The four tunnels at Clear Creek at first appeared to be utterly destroyed. Tracks were uprooted and buried in some places beneath the caved-in concrete walls. The ground dropped and long stretches of track sagged over space. The distance between the portals of Tunnel Three and Tunnel Four had actually shortened eight feet! The rails between them were twisted in weird S-shapes and the tunnels glutted with rock and rubble.

Southern Pacific's top officials rushed to the scene by special train and automobile from San Francisco. Before the end of the first day, the Morrison-Knudsen Company was engaged for the long work of reconstruction. The company, famed for engineering feats accomplished in every corner of the world, quickly started moving men and equipment into the quake area from projects all over the United States.

Within 10 days, using chartered planes, trains and huge flat-beds preceded by siren-screaming police escorts, Morrison-Knudsen and the railroad assembled the greatest emergency concentration of earthmoving equipment ever seen in the United States. About 175 pieces of big machinery tore into the mountainsides, guided by a thousand construction and railroad men.

The job was made doubly complex by

its remoteness in the heart of the deceptively smooth Tehachapi Mountains. A new road had to be slashed three miles into the site. Then the vast array of carryalls, bulldozers, trucks, muckers and steam shovels had to coordinate operations in an area scarcely twice the size of Pasadena's Rose Bowl.

To add to the tension, more than 100 aftershocks rumbled ominously. No man could tell if the next shock would bring an epic of destruction.

In 23 days the Morrison-Knudsen men "daylighted" two tunnels — ripping the rock covers from them and leaving them exposed as two raw cuts in the mountain. A third tunnel lost 200 feet of its protective covering.

The fourth and longest tunnel, Five, presented an 1170-foot problem. To get important freight rolling again, this tunnel was temporarily by-passed by a "shoofly" that was nearly $\frac{1}{2}$ mile long. The shoofly was a vast fill of dirt, built up load by load from the floor of the canyon until it was brought level with the twisted rails of the old roadbed.

More than 1,250,000 cubic yards of dirt were moved in that jammed area in 23 days. The fill was decomposed granite that compacted quickly. Hard on the tail gates



Twenty-six days after the quake, a string of 100 empty cars inched westward over the rebuilt right of way

of the wallowing carryalls, track layers shoved down new lines of steel.

On the morning of the 26th day, a string of 100 empty freight cars inched around the canyon, testing the temporary trackage. It held firm, and the defense materials were on the move again.

But the shoofly trackage was only a makeshift answer. The curves were too great and the grade too steep to allow the maximum use of the rail line. It was absolutely vital that Tunnel Five be restored in order to bring back the rail line to full capacity. It had suffered the grinding, shearing wave that ripped three other tunnels. Beyond that, Five had been crushed and glutted for nearly 400 feet with a maddening rubble of rock, huge slabs of concrete, twisted rails and reinforcing beams.

The rubble had to be cleared foot by foot and dumped into the canyon. Fractured rock walls were tested, proven and reinforced beyond any doubt. Afterward came the concrete facing, 23 inches of safety that would be immune to the solid blast of an atom bomb, but would always leave a question mark to the most shattering force ever witnessed by man, a full-scale earthquake. ★ ★ ★

Equipment "daylighting" the east end of Tunnel Three, removing the rock covering over 250 feet of its length





Device Applies Cemented Tape to Wallboard Joints

Combining two operations, a simple device cements and tapes joints between adjoining wallboards. Enough tape for the average room is contained in a roll which is held against the bottom of the troughlike container by means of tension bars. Immersed in cement, the tape is thoroughly covered before it passes out the front slot

and onto the wall. Light in weight, the device is made of galvanized iron and will last indefinitely as there are no moving parts. A special slot arrangement permits the use of different inserts to facilitate tape application on inside and outside vertical corners, vertical wall joints and horizontal ceiling joints.

Increased Water Use Caused by New Industries

In 50 years, industrial water consumption has jumped 800 percent, according to the President's Material Policy Commission. New industries that use tremendous amounts of water are a chief reason for the rise. Approximately 1,050,000 gallons of water are needed to produce 1000 barrels of aviation gasoline, and 15,800,000 gallons are necessary to turn out 1000 gallons of synthetic gasoline. A ton of rolled steel calls for 80,000 to 110,000 gallons, a ton of viscose rayon from 180,000 to 200,000 gallons.

Predict Intercity Helicopters For Short-Distance Runs

Helicopters carrying 50-passenger loads may soon replace regular airplanes on intercity runs less than 350 miles in length, according to an industry spokesman. The average big-city airport is 35 minutes away from the downtown area. Thus, if the distance is less than 260 miles, it's quicker to go by a helicopter that flies at 125 miles per hour than a regular plane that has a 300-mile-per-hour speed. Helicopters will also be used to carry passengers from downtown heliports to near-by airports.

Children's Auto Seat Permits Standing in Safety While Riding



Since cars were first made, there's been a continuous battle between small children, who insist on standing up while riding, and parents concerned with safety. Victory for both sides is promised by a safety seat which drops the bottom when Junior wishes to stand. A safety belt holds the child securely. A guard, in place while riding, swings out of the way to permit entry to the seat. The seat folds compactly.





American-Swedish News Exchange photos

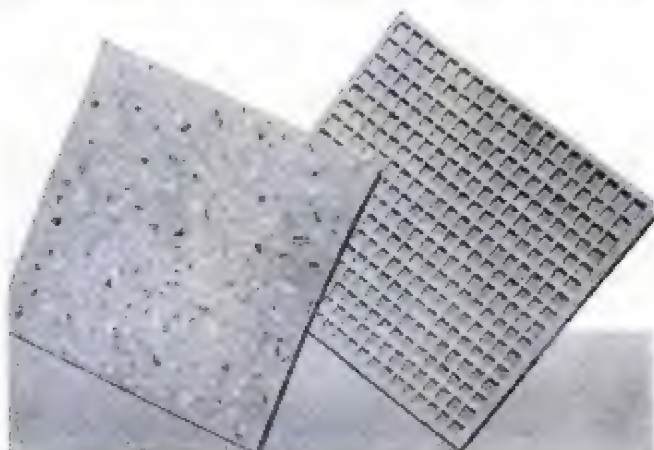
Corrugated-Rubber Floor in Swedish Barn Uses No Straw

Corrugated rubber covers the entire floor of a new dairy barn built in Sweden. Rubber flooring eliminates the need for straw. The manure moves down a rubber conduit and is collected in a basin below the barn. In liquid form, it is pumped into tank cars which are towed into the fields. There the fertilizer is disked into the earth by a special tire-mounted implement. The corrugations in the rubber flooring permit air to circulate beneath the cows when they are lying down.



Plastic Floor Tile With Honeycombed Back Needs No Adhesive

Adhesives are unnecessary in laying a floor with a new plastic tile—its honeycombed back exerts a suction-cup effect that holds the tiles in place. Because there



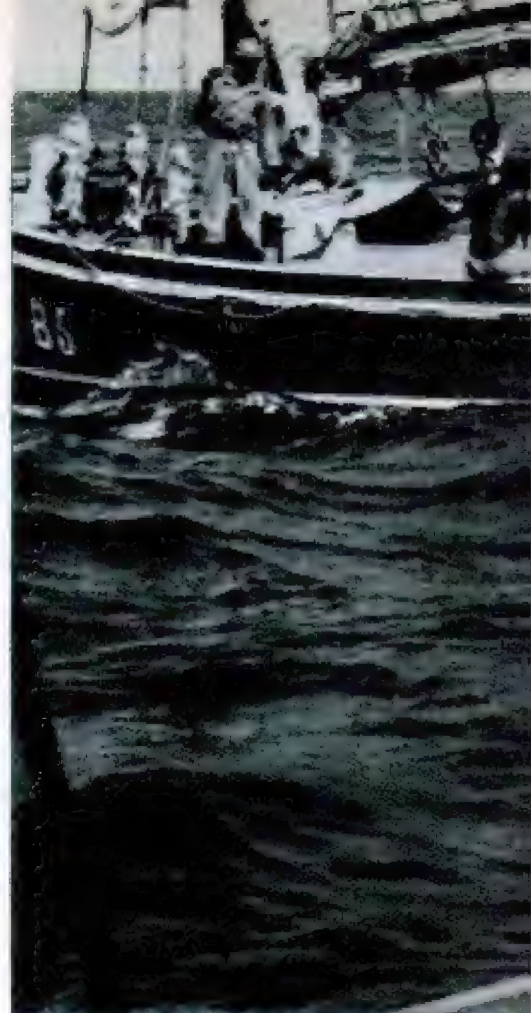
is no adhesive, the tile can be laid below grade level where moisture is excessive. Twice as thick as conventional tile, the new floor covering can be picked up and taken with you if you move. Or, if you grow tired of one design, you can rearrange the tile to a new pattern. According to the manufacturer, the tile can be installed over uneven wood floors and still produce a smooth surface. It is not necessary to prepare the floor beforehand. Being plastic, the tile requires no waxing or maintenance other than the usual washing. The tile neither expands nor contracts after installation and is not affected by shifting of subflooring.

❑ Live lobsters hermetically sealed in cans are now available to the housewife who wants her sea food fresh.

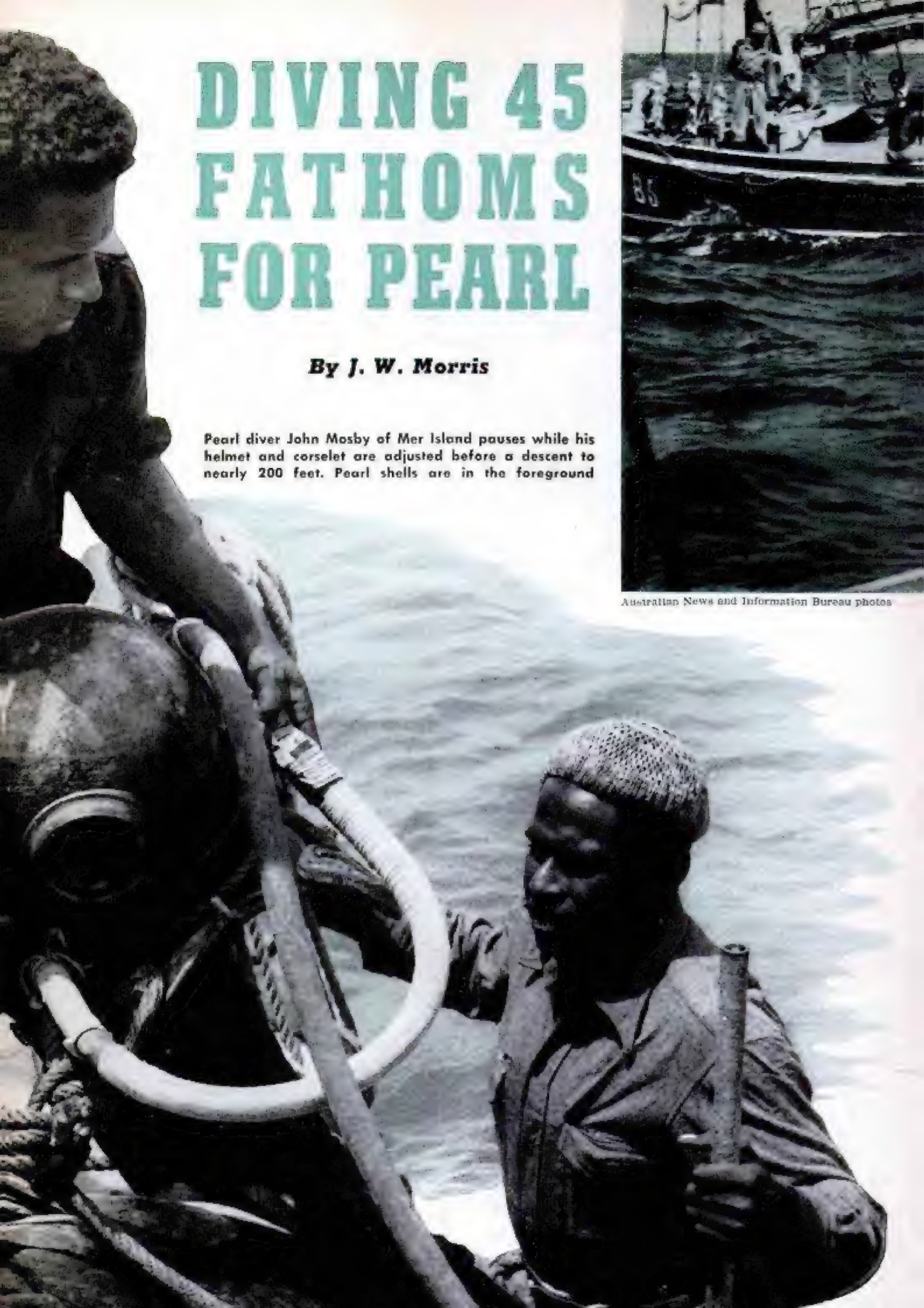
DIVING 45 FATHOMS FOR PEARL

By J. W. Morris

Pearl diver John Mosby of Mer Island pauses while his helmet and corselet are adjusted before a descent to nearly 200 feet. Pearl shells are in the foreground



Australian News and Information Bureau photos





HOW FAR DOWN do you think a deep-sea diver can work in comfort? Some experts say only to a depth of 25 fathoms (150 feet), but divers of the Australian pearling industry often work to 45 fathoms (270 feet) as they comb the depths for the fabulous mother-of-pearl shell.

The depths worked by the Australians surprise many experts of deep-sea diving, but these natives are trained for the work from boyhood.

Today, the two main pearling ports of Australia are at Broome and Thursday Island, where more than 250 pearling boats, manned by mainland natives or Torres Strait islanders, seek the elusive pearl shell.

Unlike deep-sea divers employed by harbor or maritime services, pearl divers do not use standard diving suits but wear only old clothing, a diver's helmet and a weighted corselet. They claim this equipment affords greater safety against sharks and big fishes as well as distributing more evenly the pressure of sea water over their bodies when working at depth. Many divers were attacked by sharks when a full diving suit was worn, but no cases of shark attack are known since the introduction of helmet and corselet in 1930. Pearl divers claim that the air turbulence caused around the shoulders of the corselet by escaping air, frightens sharks away, but the bigger groper or cod will sometimes attack and many divers wear scars to prove it.

More than 250 pearling boats operate out of Broome and Thursday Island, Australia's busiest pearling ports. A lugger carries a crew of eight or nine and its "fishing" season lasts from March to December.

Perched on a platform rigged out from the side of a lugger, the diver's tender gives his charge more line so that he can move about more freely for scattered shell. He also regulates the diver's air pressure.





Lugger crewmen open and clean shells, keeping a watchful eye for pearls, before packing the haul in sacks

But let us take a look into the lives of these men who daily establish depth-diving records and earn for Australia millions of pounds and dollars in exchange for mother-of-pearl. Pearl divers are not supermen in physique. On the contrary, they are normally built men who have followed their calling for a lifetime.

They do, however, possess characteristics which fit them ideally for the job. First, they do not suffer from claustrophobia (fear of enclosed places) and, second, they have a wide knowledge of marine life and marine terrain, gained during many years of fishing and sailing dinghies across the reef-studded waters of Torres Strait. In the case of Torres Strait islanders, their elevation to a crew member of a pearling lugger has followed their mastery of skin diving for trochus or other shell fish. There are now 90 pearling luggers operating for the

Torres Strait pearling fleets and each lugger is manned by at least nine men.

Lugger captains dive from the stern because their knowledge enables them to cope with any emergency of life lines fouling propellers or tillers. The second diver works from amidships, the third from up forward and a try diver (learner) works from the bow. Their designation and working position identify their seniority of command. Each has a tender (diver's mate) who regulates air pressure and controls life lines, and who must be expert in depth working so that he knows the technique of staging a diver to the surface. As he is brought up from the depths, a diver is staged by resting him for 10 minutes at each five-fathom lift. The depths of 25 fathoms (150 feet) and 10 fathoms (60 feet) are depths where care must be exercised.

Pressure is indeed a major factor in a diver's life, for when he is at 45 fathoms a pressure of 155 pounds to the square inch is exerted over his entire body and by staging this pressure is gradually reduced as he is brought to the surface.

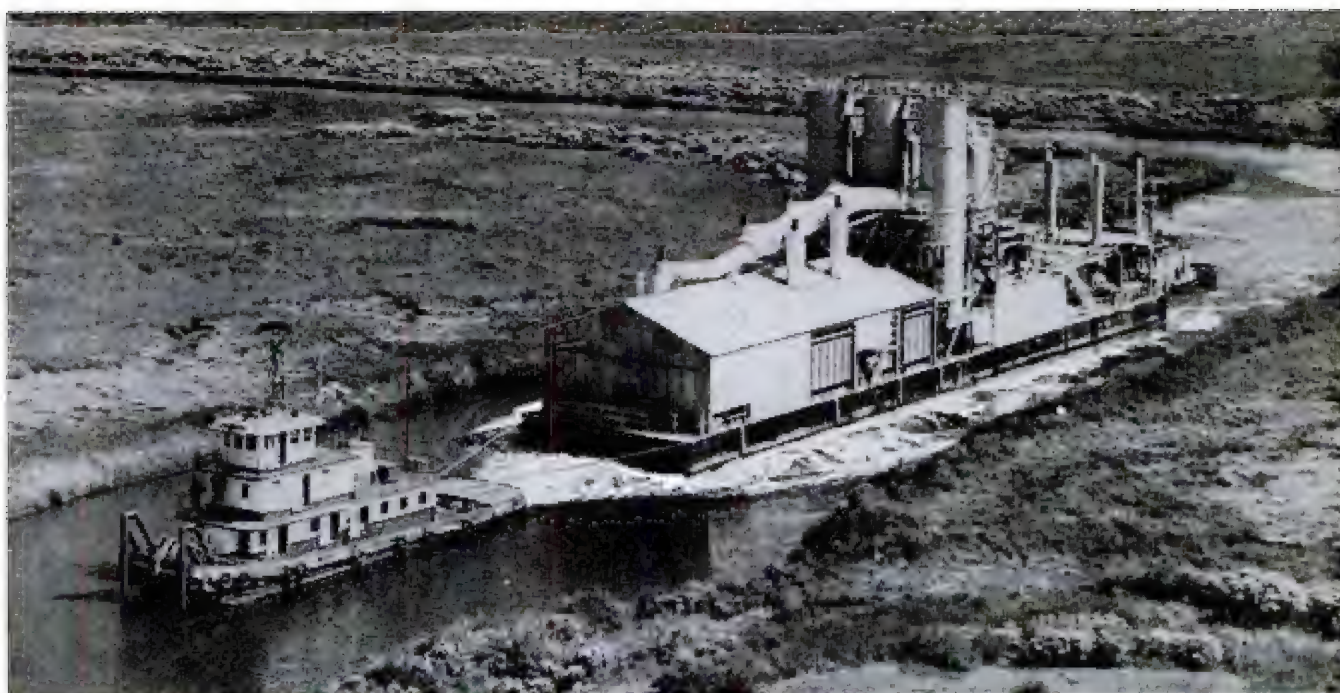
If a diver is brought to the surface quickly, the pressure against his body drops rapidly and he is attacked by diver's "bends," which can be fatal. In harbors or river ports, decompression chambers are used for such emergencies and the diver is placed inside, where the pressure is again raised and lowered until he gets relief. Men who work in air locks are similarly treated.

But there are no decompression

(Continued to page 270)

Islanders of the Torres Strait carry ashore about 200 pounds of pearl shell, which will sell for approximately \$2000 a ton





Barge-Borne Sulphur Plant Floats to Bayou Site

Floated to its site in a marshland area of the Louisiana bayou country, a sulphur mining plant recently began extraction of the mineral. Construction costs in the mining area would have been prohibitive. So the plant was built atop a 200-foot-long barge at Grande Ecaille, La., and towed 65 miles to the Bay St. Elaine. Workmen immediately anchored the buoyant plant to

pilings to secure it from storms, and made connections with water, steam, air and sulphur lines running to outlying wells. Water was let into the barge's hold so that it could settle to the bottom. Molten mineral from the plant is transported in insulated barges to storage at Port Sulphur on the Mississippi river. The amphibious mining plant was constructed at a cost of \$2,000,000.

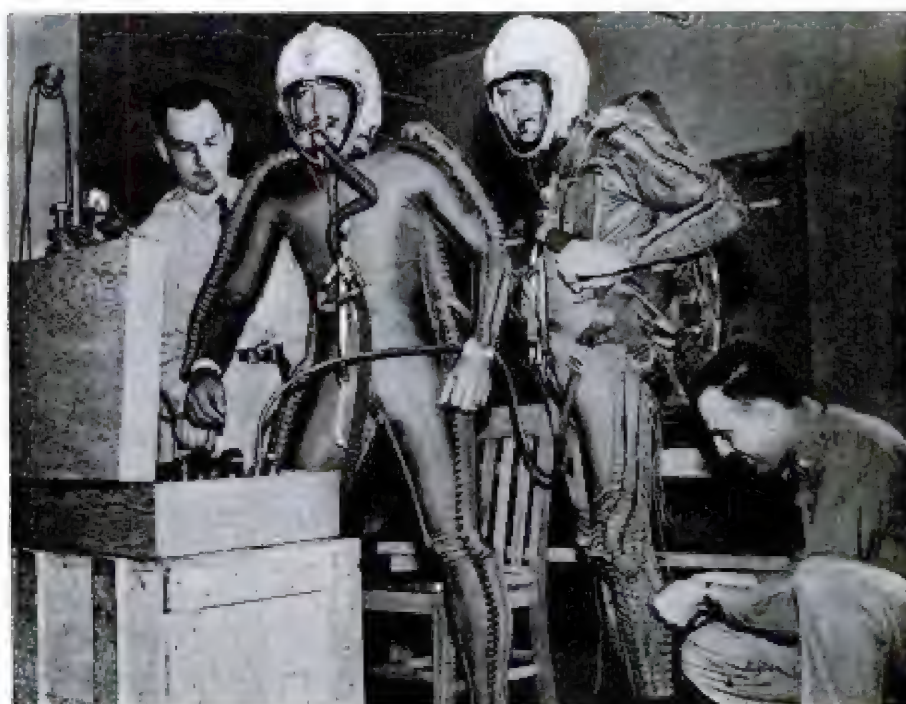
Analyze Fish Noises For Clues to Detection

Fish reveal their type and position by the sounds they make, United States Fish and Wildlife Service scientists have found. Underwater recordings of noises made by different schools of fish are being analyzed by the bureau, and work will soon start on

listening devices particularly sensitive to the sounds of commercial fish like tuna and mackerel. Fishermen equipped with such listeners would be able to use them to great advantage in tracking down the elusive harvest of the sea.

Pressurized Suits

Weirder than the space suits of science-fiction heroes, a pressurized suit tested recently by the Air Force is designed solely for flying in the upper reaches of the earth's atmosphere. Flexible tubes along the sides of the suit inflate if the cockpit or cabin of the plane loses pressure at high altitudes, tightening the garment to provide pressure equal to the atmosphere's. The suit is completed by a one-piece helmet featuring an electrically heated face plate to prevent frosting from the pilot's breath.





Miners charge holes with explosives as they mine ilmenite, an ore that supplies titanium, at Lac Tio, Que.

Titanium—the “Tough Guy” of the Lightweights

By Ewart Thomas

YEAH, TITANIUM would be all right,” the aircraft engineer growled, “if it didn’t cost 20 bucks a pound, if you could bend it in two directions, if it didn’t spring back out of shape, if . . .” and he went on reciting other objections.

“However,” he concluded, “we have to have it and so we are going to whip every one of its drawbacks!”

Major parts of one new supersonic research plane are fabricated of titanium because the engineers had no choice. If they had built the plane of aluminum it wouldn’t have been strong enough to fly; if they had built it of stainless steel it would have been too heavy to get off the ground.

Titanium is almost as strong as stainless steel and it weighs approximately half as much. It’s four times stronger than some aluminum alloys at only twice the weight of aluminum. And it stays strong at temperatures at which aluminum fails.

If the steel-alloy parts of a B-36 were replaced with lightweight titanium the plane would be just as strong and could carry an extra ton of fuel. Used in the leading edges of a multi-Mach aircraft, titanium stands up to atmospheric frictional heat that would cause an aluminum wing to crumple. Aluminum loses much of its strength at 300 degrees; titanium stays strong above 700 degrees.

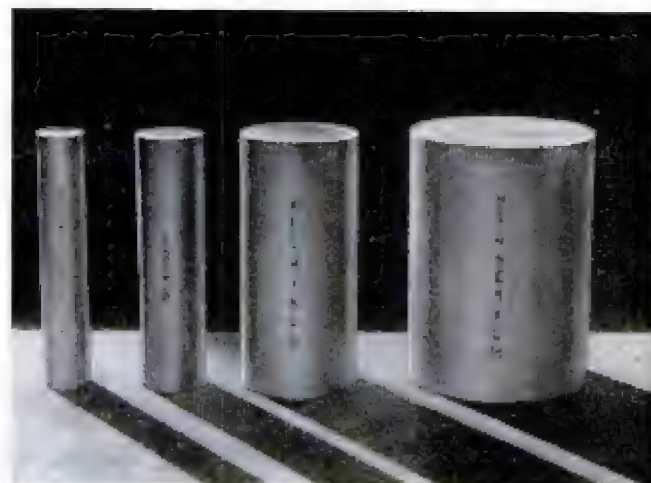
Titanium's resistance to corrosion is matched only by platinum, which it resembles in appearance. And titanium seems to be entirely unaffected by long immersions in sea water.

These are some of the reasons why it has been hailed as the Cinderella of metals, the "miracle" metal, the middleweight champion of all structural elements. But, in backstage whispers, everyone associated with it has been calling titanium a lot of other things, not half so complimentary. The trouble is that titanium is stubborn and balky. It won't permit itself to be refined by ordinary methods and it doesn't always lend itself to easy fabrication. It's the number-one problem child of metals right now.

Nevertheless everybody wants it. The aircraft industry could use thousands of tons of titanium a year and it has been spoken of as the best material for building guided missiles and space ships. The Army would like to mount titanium armor on lightweight tanks that could be dropped from aircraft. Ordnance could use it to replace heavier metals in ground-force equipment. It would make an ideal lightweight rifle for the infantry.

For marine use the Navy would like it for valves, heat exchangers, propellers and shafts, steam-turbine blading and for snorkel tubes on submarines.

The Atomic Energy Commission already is using quite a bit of titanium for undisclosed purposes. The chemical industry



These bars illustrate the strength of titanium compared to other metals. All will stand the same load

wants all it can get for anticorrosion pipes and valves; the railroads would like to use titanium for structural parts in much of their rolling stock, and the petroleum industry thinks titanium would be ideal for lightweight drill pipe for deep wells. It has even been suggested for pots and pans and razor blades that would be almost everlasting in their usefulness.

Titanium is the fourth most abundant structural metal in the earth's crust, the ninth most common element, yet it was selling for \$3000 a pound only five years ago. Not until 1946, in fact, was it available at all except in laboratory amounts. In that year the Bureau of Mines announced a process developed by William J. Kroll, bureau consultant, for extracting

Titanium has to be welded in an atmosphere of helium inside an airtight drum so it won't combine with oxygen and become brittle and useless. Rubber gloves around drum enable the welder to get at his work from any angle

A. Audrey Bodine photos





High-grade titanium slag being cast at the Sorel, Que., smelter that handles ilmenite ore from Lac Tio

titanium from its ores for the first time in worth-while amounts.

Titanium melts at 3140 degrees, compared to 2100 degrees for cast iron and 1220 degrees for aluminum. At first this high melting point seemed very desirable, then it was learned that at not much above 1000 degrees the new metal becomes greedy for oxygen, nitrogen and even water vapor

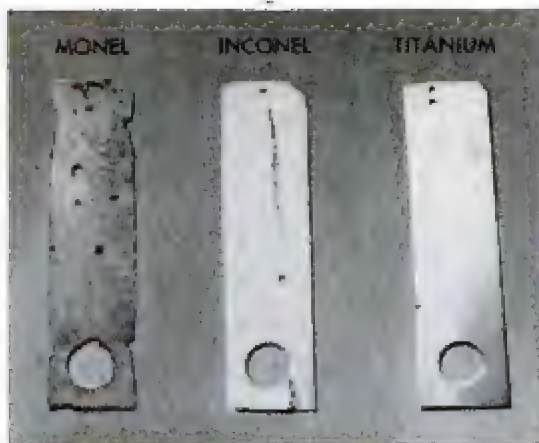
Absorbed from the air, these substances make titanium almost uselessly brittle. And, when molten, titanium behaves like a universal solvent and eats into all known refractory materials. Metallurgists almost threw up their hands in despair. It was a real achievement only three years ago when a 10-pound ingot was produced.

New troubles arise when titanium is

Airplane-engine exhaust system is given a titanium shroud that serves as a heat shield to protect other engine parts

Samples of the shapes into which temperamental titanium can be worked before part fabrication





Rem-Cru Titanium, Inc., photo

Only RC-70 titanium (right) was entirely unaffected by 480-day period in sea water

formed into sheets and other shapes. It can't be brazed in the usual way because it builds up surface oxidation at brazing temperatures. It can be spot-welded but not fusion-welded. Milling and lathing operations are difficult. Sawing is almost impossible because the frictional heat of the tool hardens the metal while it is being worked.

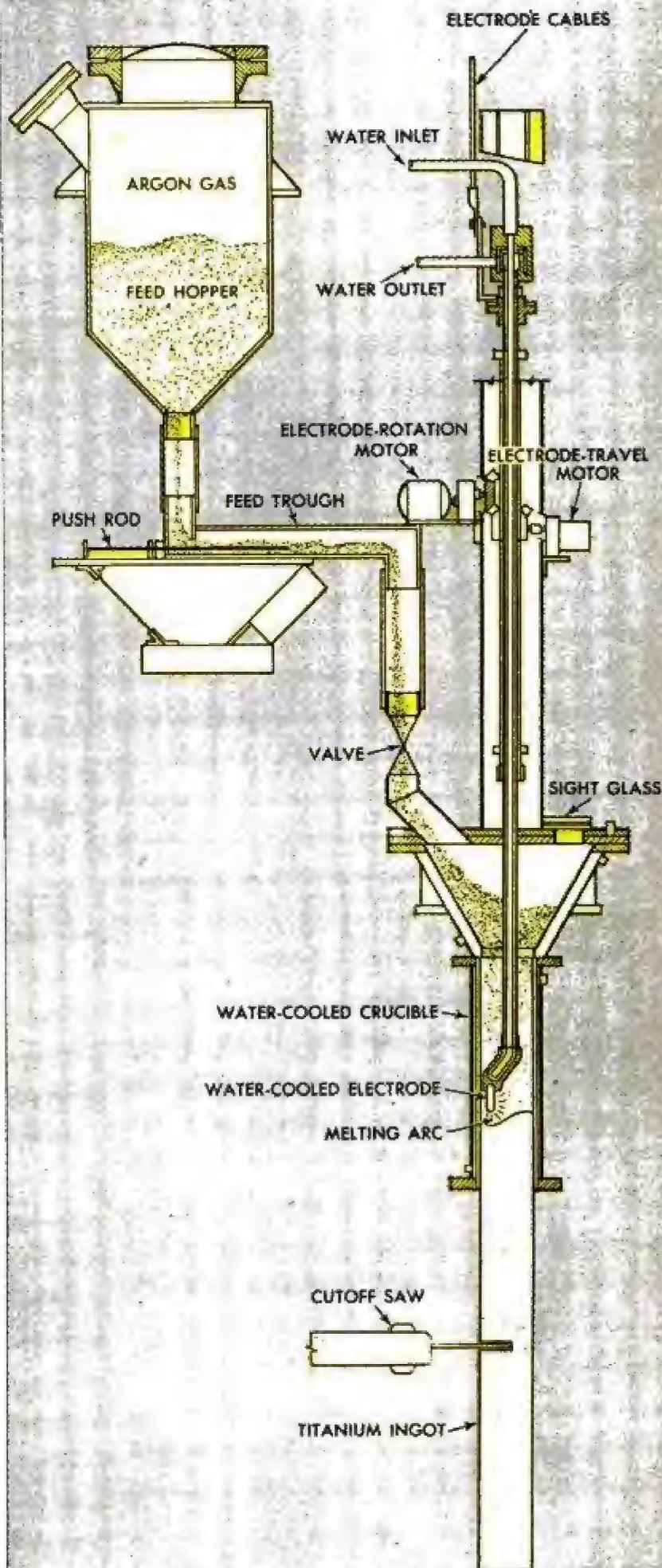
But titanium's good properties are so outstanding that many branches of industry are cooperating in an all-out campaign to lick the problems that the new metal presents. Du Pont alone is spending a million dollars a year on research and on ways to refine the metal.

Metallurgists recall that aluminum once seemed to offer insurmountable refining problems and yet today aluminum is one of the cheapest and most useful metals we have. Stainless steel, too, had troublesome characteristics that had to be overcome. Magnesium is an even more recent example of how a problem metal can be conquered for industrial use.

Right now titanium is going through a similar period of development. In some ways the techniques developed for stainless steel can be adapted to it, such as the use of cutting tools that have been superhardened by nitriding or by being stored in subzero chambers for a time. One new development is to keep titanium cool while being worked upon by directing a constant blast of freezing carbon-dioxide gas against it.

Titanium is refined from titanium dioxide, obtained from ilmenite

Arc-melting furnace, right, uses hot arc to convert titanium sponge to metal ingot





These women are fabricating lightweight aircraft parts from sheets of titanium at a Lockheed factory

**12 MOST ABUNDANT ELEMENTS
IN THE EARTH'S CRUST**

ELEMENT	PERCENT
1. Oxygen	46.71
2. Silicon	27.69
3. Aluminum	8.07
4. Iron	5.05
5. Calcium	3.65
6. Sodium	2.75
7. Potassium	2.58
8. Magnesium	2.08
9. Titanium	0.62
10. Hydrogen	0.14
11. Phosphorus	0.13
12. Carbon	0.09
All Other Elements	0.44
	100%

Source: "Handbook of Chemistry and Physics," 26th Edition.

ore that occurs in large quantities in Quebec and New York, among other places in North America. The rutile beach sands of Florida are another source of titanium. The dioxide has been used for a long time as a white pigment in white-wall tires, house paints, enamel, linoleum and in the paper industry. Powdered titanium oxide, blown through a very hot flame, condenses and forms a synthetic gem stone that possesses the highest known index of refraction, more brilliant than the diamond.

The Kroll process of producing titanium metal uses chlorine to create titanium tetrachloride, a heavy colorless liquid, which is then mixed with molten magnesium in a red-hot steel container under a blanket of argon or some other inert gas that excludes the atmosphere and thus prevents contamination by oxygen or nitrogen. The magnesium combines with the chlorine to produce magnesium chloride, leaving the pure titanium as a porous spongelike clinker.

Next the sponge is reduced to a solid ingot by being melted down in an electric induction or arc furnace,

(Continued to page 266)

Engineer watches heating coil as it is used to silver-braze titanium parts inside a helium-filled jar



Sponge titanium is hard to handle. It is broken up by air hammer after purification in vacuum furnace



Bureau of Mines photo



Wilford L. Miller photos

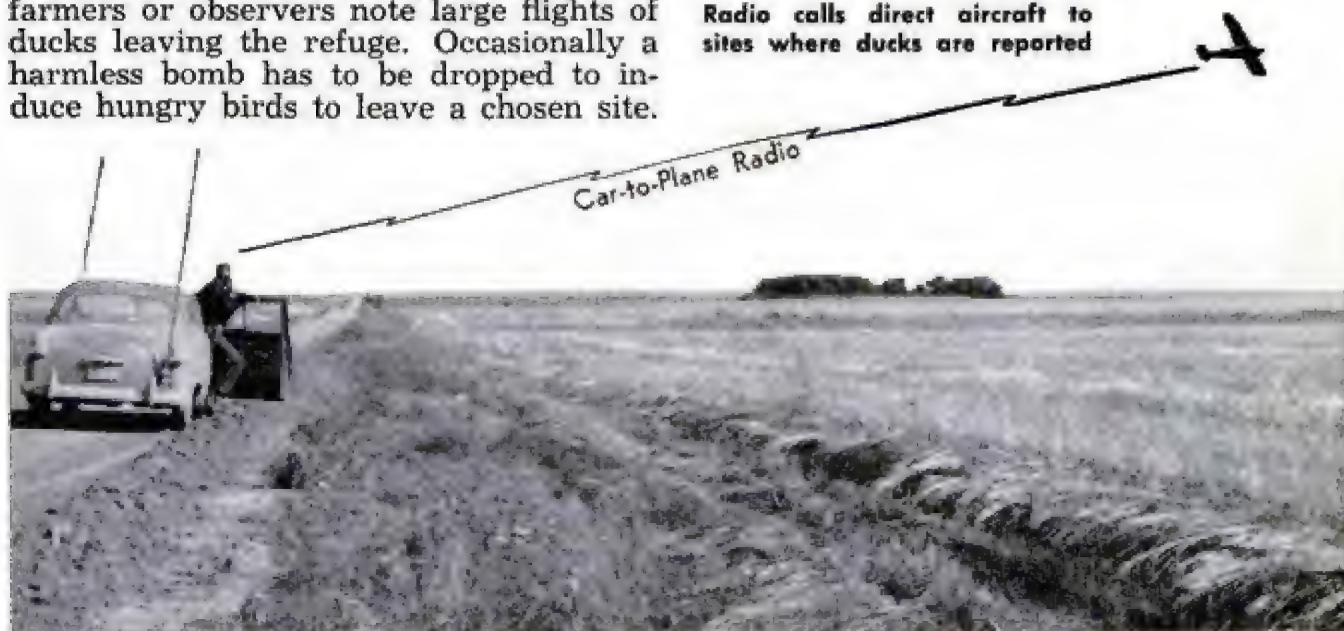
Light aircraft herding a flight of ducks. Below, spreading grain for fowl at Lower Souris, N. D., refuge

Planes Herd Ducks to Refuge

AIRPLANES and smoke-and-noise bombs are helping drive wandering waterfowl away from unharvested grain and back to the huge Lower Souris refuge in northern North Dakota. About two thirds of the refuge's 250,000 to 300,000-bird population consists of pintail and mallard ducks whose chief food is grain. Twice daily, trucks scatter grain at designated feeding sites. The United States Fish and Wildlife Service's aerial herdsman are called into round-up action by two-way radio whenever farmers or observers note large flights of ducks leaving the refuge. Occasionally a harmless bomb has to be dropped to induce hungry birds to leave a chosen site.



Radio calls direct aircraft to sites where ducks are reported





"Lemon Powered" Autopilot for Lightweight Aircraft

Tiny motors so sensitive they can be driven by "lemon power" are used in a new automatic pilot for light aircraft. When a silver and a copper coin are embedded in a lemon, and the motor leads placed in contact with them, the motor spins just as if it

were attached to a battery. The complete unit weighs only 39 pounds. It flies the plane "hands off" on long flights and permits the pilot to "ride down" an ILS approach beam by regulating his air speed. The unit employs magnetic amplifiers.

Welding Liquid Mends Broken Plastic Articles

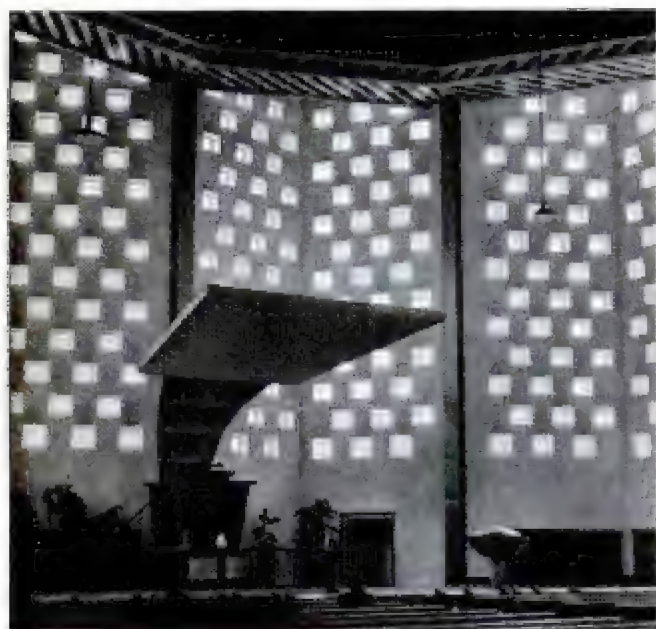
Plastics are welded by a new liquid which speedily repairs cracked dishes, toys and fixtures. The mixture is applied sparingly to the broken surfaces, which are pressed together for a few seconds and then left to

set for one hour. The result is said to be an actual fusion of the parts. Over 1000 repairs can be made with the contents of a one-ounce bottle, which contains a nylon brush for easy application.

Dutch Church Is Constructed With "Accordion" Walls

Radically different from the traditional ivy-covered cathedral is a new church at Amstelveen, the Netherlands, near Amsterdam. "Accordion" construction of the walls gives a feeling of spaciousness, enhanced

by an exceptionally high roof. A total of 966 small window panes in three walls provides a diffused light which penetrates to all corners of the building. Lead-covered wooden spires top the steeples.

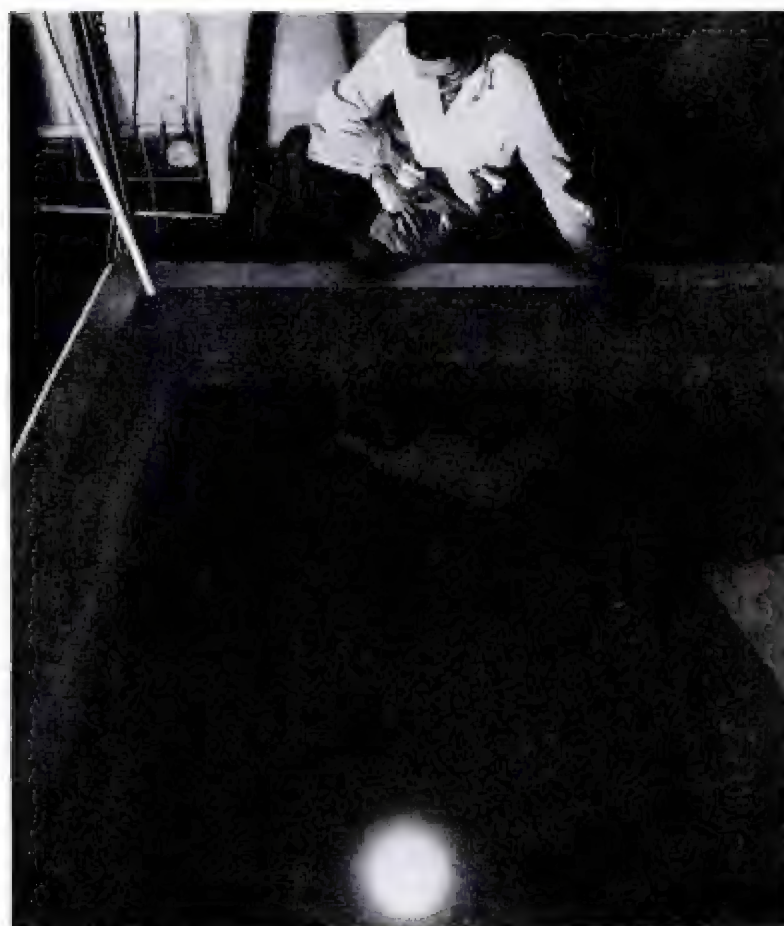




Boats Sheathed in Glass With Workshop Kit

Boatowners can now cover their craft with leakproof laminated glass-fiber cloth by using a kit designed for easy application. Ready-mixed resin and laminated glass-fiber cloth cut to size are included in the kit, along with simple instructions. The fabric prevents soaking, swelling or drying

of the surface, resists rot, shrink, stretch, mildew or fire, and increases the impact resistance of the structure. If the planking of a hull should be smashed, the laminate could prevent any leakage. One man can cover a small boat in a day's time, according to the manufacturer.



Radioactive Material Emits Powerful Glow

Submerged below nine feet of protective water, a supply of radioactive cobalt at an atomic laboratory emits an intense bluish-white glow. Equal in intensity to twice the present world's supply of radium, the 2½ pounds of cobalt are contained in 10 cylindrical capsules mounted in holes in a steel plate at the bottom of the concrete pit. General Electric scientists are using the radiation source to test materials to be used in the power plant of an atomic submarine. Test samples are lowered into the tank, remain there for a period of time, and are withdrawn for study. The glow produced, enough to illuminate an entire room, is the result of interaction between the gamma rays and atoms of water.

☐ One ton of fuel a minute is burned by a new U. S. supersonic military research plane.



U. S. Air Force photos

Much of a future helicopter pilot's time is spent learning the mechanical make-up of the big "eggbeaters"

"WHIRLY BIRD" PILOTS GO TO SCHOOL

By Norris Jackson

C LIMBING DOWN from the cockpit after his first trip aloft in one of war's newest innovations, a veteran fighter pilot chanced the remark to his instructor, "We probably won't be able to fly these things by the seat of our pants, but one thing is certain: If there was something we could do with that part of our anatomy, the manufacturer would have us doing it."

In a few words, he summed up the activity of a helicopter pilot in flight. Without doubt, the pilot of war's craziest contraption is the busiest of all combat flyers.

The cockpit of the giant "whirly bird" is a great deal like that of a fighter or bomber. The big difference is the extra stick, on the left side of the pilot's seat, which moves the craft up or down. On the stick is a motorcycle grip, replacing the fixed-wing craft's throttle for power.

The stick in the center governs lateral directions of forward, backward or sideways. On the floor are pedals much like rudder controls familiar to the fixed-wing plane. Unlike the conventional-aircraft rudder controls, however, they are antitorque devices which keep the copter from going into a horizontal flat-spin, whereby the fuselage rotates at the same speed in opposite direction of the main rotor.



"Keeping those sticks, throttles and pedals working together doesn't give a guy much time for thinking about the blonde at home," the student continued. "You don't have time to think of anything but keeping the ship right side up. And once you get on the ground after a three or four-hour flight, you're too exhausted to do any thinking." Three hours at the controls of a helicopter compares to six in a fighter.

Constant vigilance and control of the plane's altitude, which is as changeable as a frivolous chorus girl, is a must. The pilot's hands and feet must be on the controls at all times, with possibly a few seconds needed to read a map, when the right hand is kept on the throttle. Even then, the frisky contraption is apt to peel off into any altitude, including upside down, which happens when the blade angle of the tail rotor is not coordinated with the torque of the main rotor and engine. There's a conspicuous absence of "flying by the seat of his pants" or by radio.

For five grueling weeks the fighter pilot and his fellow students learn about the in-



Precision control is emphasized in flight training. Here a student is splitting the circle, a proficiency demonstration while hovering

stability of the helicopter before going into advanced phases. These featuring equally long and difficult tactical training, are taught at San Marcos Air Force Base, Tex., the Air Force's only school for helicopter pilots.

On another part of the field, Army Field Force officer-students receive similar pilot training under Air Force supervision. At the end of their basic five-week course, however, the Army students move to Fort Sill, Okla., where they concentrate on applying the helicopter to combat conditions in support of ground units and for ground

Thousands of Korean war casualties owe their lives to helicopters swiftly transferring them to rear areas





Main rotor-pitch control stick, at pilot's left, is the principal cockpit difference between a helicopter and a conventional airplane. A motorcycle grip on the stick replaces the fixed-wing craft's throttle for power



Fitted with a pontoon-wheel combination for landings on water or land, a single-rotor Sikorsky H-19, the Air Force's helicopter giant, settles to a gentle touch down. First-aid instruction occupies much of a "whirly bird" pilot's schooling. After 20 hours of classwork he can recognize and give emergency treatment for most rescue situations he will encounter



force search-rescue work.

For the most part, Air Force helicopter pilots are volunteers. All are rated fixed-wing pilots, and the majority are former fighter and bomber men who logged time over Nazi and Jap industries during World War II and, more recently, the North Korean mountains. Army students hold Army aviator ratings. Training also has been successfully passed by NATO and other foreign students from a dozen different allied countries.

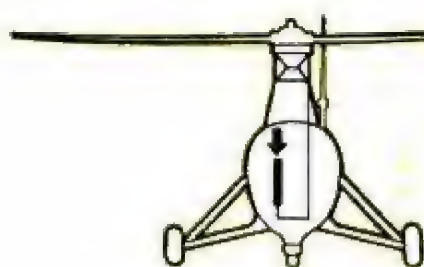
Flight instructors for both schools are men like Capt. Lyndon Thomason of San Francisco, who rescued 224 downed pilots and trapped troops during 124 combat helicopter missions, and Lieut. Donald J. Crawford, Essexville, Mich., who rescued a downed pilot near Kumhwa, North Korea, despite vibrating controls caused by hits in the rotor blades from small-arms fire.

The future pilot of the flying "eggbeater" undergoes a terrific amount of transitional flying—the change from the conventional craft to the rotary wing—during his early days at San Marcos. In reality, the course is a form of advanced flying, and is comparable to the advanced training given fighter, bomber and transport pilots after completion of the United States Air Force cadet program.

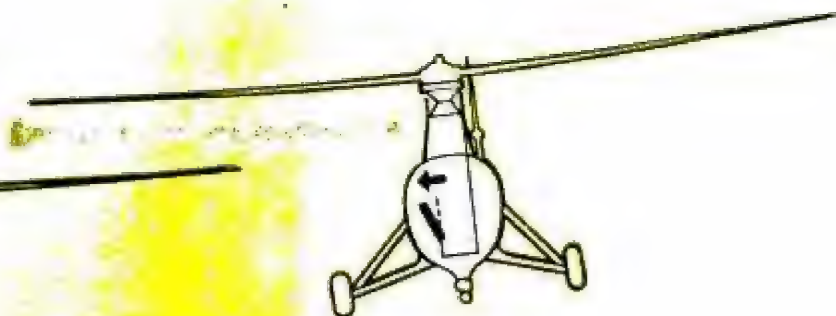
Flying only one to three hours daily, depending upon the individual's ability to absorb training, most students solo within 8 to 12 hours. But within that period, he unlearns habits formed while flying fixed-wing planes and learns new coordinations which form the basis for transformation into a proficient helicopter pilot.

"It didn't take us long

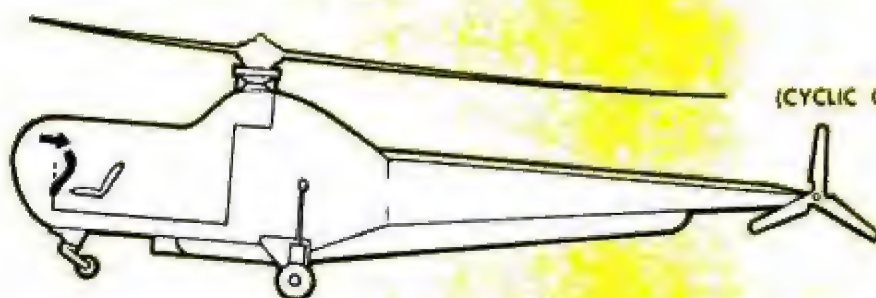
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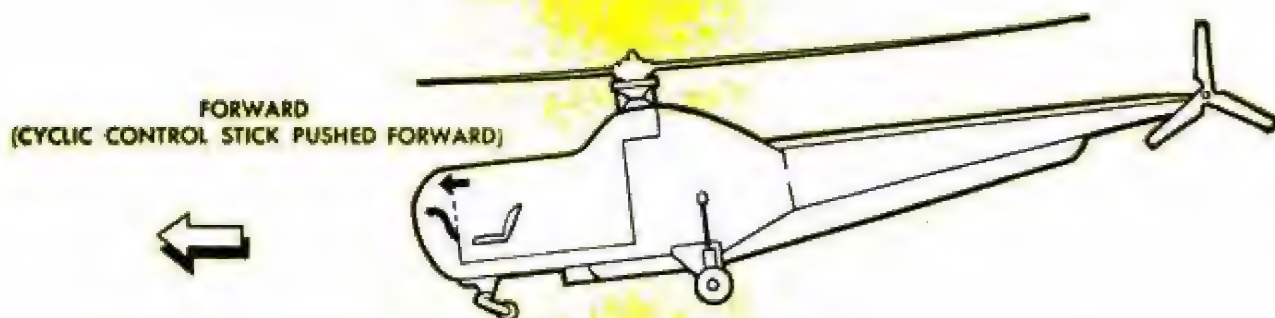
HOVER
(CYCLIC CONTROL STICK UPRIGHT)



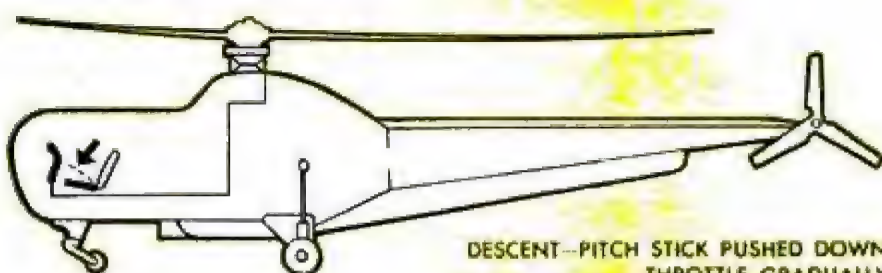
TO RIGHT, OR LEFT
(CYCLIC CONTROL STICK MOVED IN TURNING DIRECTION)



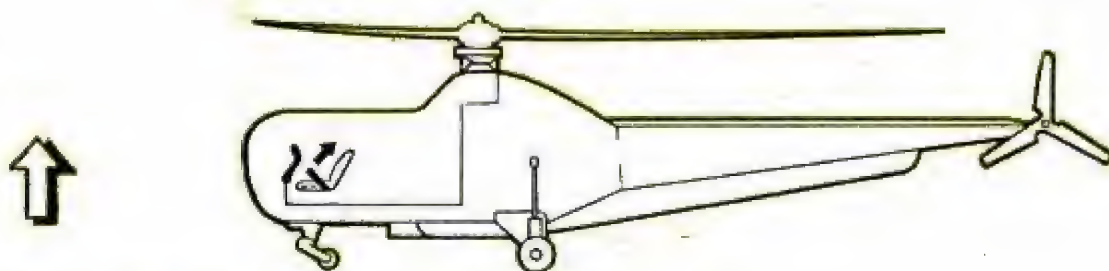
REVERSE
(CYCLIC CONTROL STICK PULLED BACKWARD)



FORWARD
(CYCLIC CONTROL STICK PUSHED FORWARD)

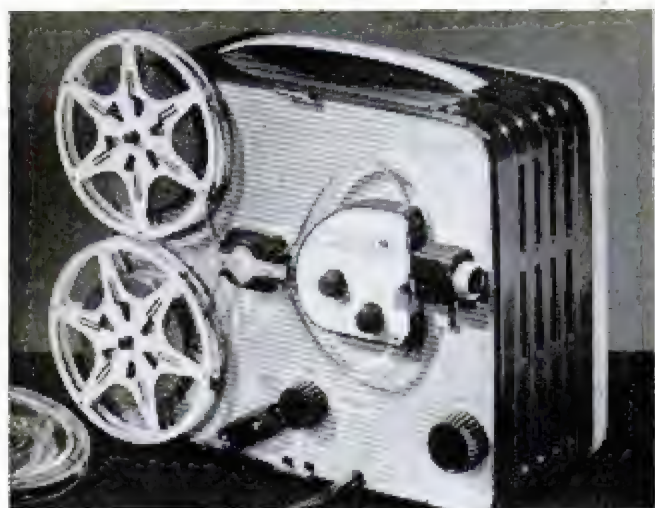


DESCENT—PITCH STICK PUSHED DOWNWARD, DECREASING ROTOR'S BITE
THROTTLE GRADUALLY CLOSES AUTOMATICALLY



ASCENT—PITCH STICK PULLED UPWARD, INCREASING ROTOR'S BITE
THROTTLE GRADUALLY OPENS AUTOMATICALLY

Home-Movie Projector Has Simplified Design



Projection of 8-mm. home movies is simplified by a portable projector with "floating power" control. A single knob is easily positioned for forward projection, stills, reverse projection or motor rewind. To simplify threading, an easily followed film path is printed behind the sprockets, which are indirectly illuminated so that the projector can be threaded in the dark. Focusing is controlled by a finger-tip lever. A self-locking tilting knob permits quick and positive screen centering, and adequate ventilation allows proper cooling by a power fan. Oil-impregnated nylon around the gears provides lubrication for all moving parts.

Marine "Hit and Git" Raids Harass Reds

Marine "Hit and Git" raids, using artillery-toting helicopters, are giving the Red enemy in Korea cause for confusion and alarm. With the four-man firing crew aboard and a multiple-rocket launcher dangling from its middle, a helicopter heads for a designated firing spot. The launcher is set down and unhooked, and the copter, its blades still revolving, waits in readiness while the crew scurries about unloading the ammunition. After the target is zeroed in, a barrage of rockets is released. Then, before the smoke has cleared, the copter picks up the crew and launcher and leaves before Red artillery can register on the firing site, which is easily tracked by the trails of smoke and the dust that are created by the rockets. A few minutes later, a repeat performance of this Hit-and-Git technique is staged at another location.





X Rays Show Presence of Weevils Inside Wheat Grains

Destructive wheat weevils are the latest "criminals" to fall victim to scientific detection. A new X-ray machine developed by Westinghouse shows the presence of weevils in samples of wheat. The bugs sometimes burrow inside the grains. To make the test, a sample of wheat is placed on a tray and radiographed. The developed pic-

ture shows black specks that result from newly laid weevil eggs, and if the larva has burrowed inside the shell it is easily detected by different shadings of the wheat grain. The new machine determines within 15 minutes whether a carload of wheat meets the standards set up by the Food and Drug Administration.

Hand Rotary Pump Moves Liquids In Either Direction

You can use a German hand rotary pump in either direction—to fill or to empty a reservoir. Its design is extremely simple with no valves to wear or get out of adjustment. The pump will move hot or cold, thick or thin liquids. It can be use to spray trees, water a garden from a well or tank, pump gasoline from a drum into a tractor or boat, or pump water from the boat bilge.

Smoke Meter Tests Air With Radar Microwaves

Radarlike microwaves are now being used to measure the amount of smoke in air. Square brass pipes carry the waves through a pair of test chambers, one of which contains pure air, while the other holds a mixture of air and smoke. The smoke particles change the effective capacity of the resonant test chamber, lowering the resonant frequency. The sensitive testing device compares the resonant frequencies of the two chambers to determine the "smokiness" of the impure air. Under development at Indiana University by Prof. H. C. Thacher and Paul B. Dorain of the chemistry department, the device is destined for use by the Army Chemical Corps.



He Bosses 11,000 Acres by Radio



Microphone speaks for Kerbs to farm crews working miles away

By Rafe Gibbs

WHEN do you think you'll start harvesting the potatoes, John?"

"Twenty days, Jim—maybe 21 or 22."

Now there was nothing unusual about this conversation—except that Jim Camp, general manager of the S. A. Camp Farms, was seated at a desk in Cawelo, Calif., and farm manager John Kerbs was bouncing along in a pickup truck out in the middle of the 11,000-acre Camp farm near Rupert, Idaho. The farm, believed to be the largest single unit in the world under sprinkler irrigation, is radio-controlled.

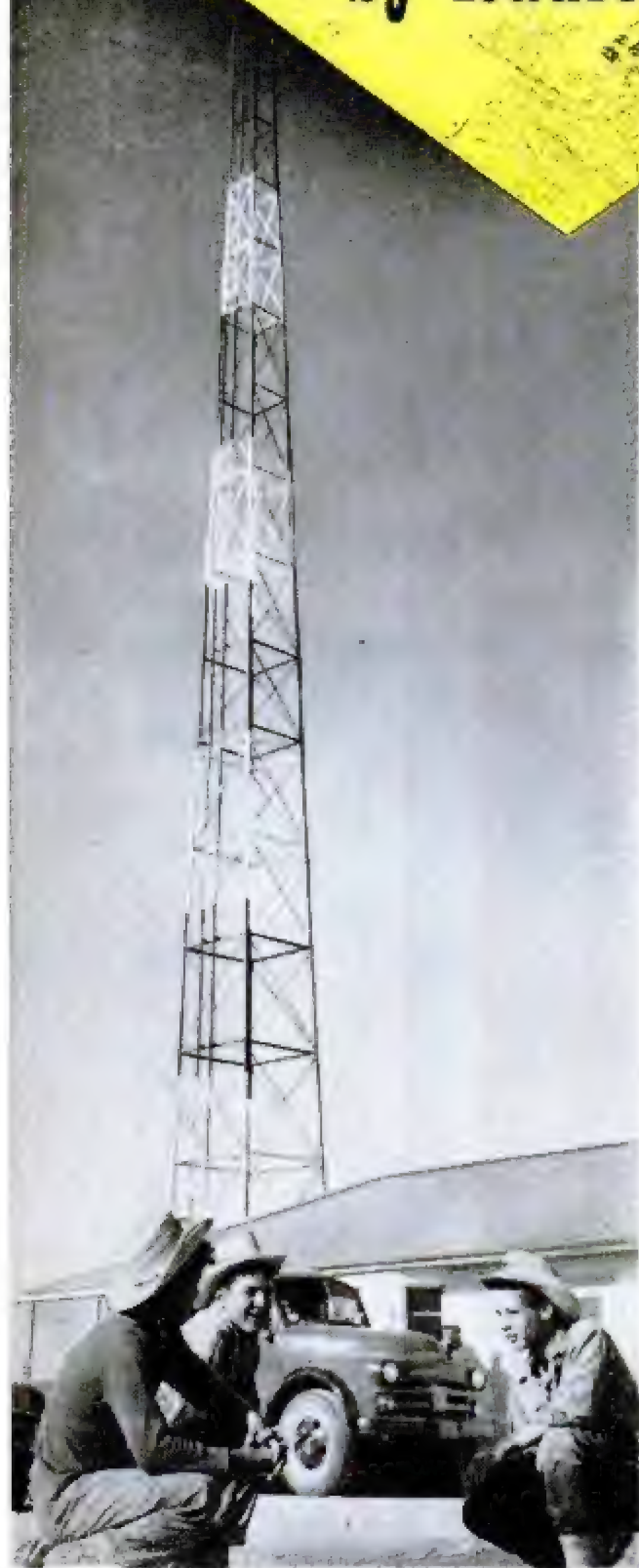
This is the way that conversation went: Camp talked by long-distance telephone to Mrs. Grace Anderson, who operates the farm's private radio station at its headquarters building on the outskirts of Rupert. Mrs. Anderson then radioed 25 miles to Kerbs in the roving pickup, equipped with sending and receiving set. Mrs. Anderson relayed both questions and answers.

This farming operation might be called the agriculture of tomorrow. On the Camp farm there are 22 tractors, and fertilizer is applied with airplanes. Some crops are seeded with showers of grain from the sky.

Kerbs, a lean, sun-tanned man in his thirties, manages the vast and intricate operations of the farm from the seat of a pickup. This modern farm administrator is far removed from the early Southern plantation manager, who used to ride horseback for days to cover the same ground Kerbs covers in hours. But that's probably where the Camp story should start—in the deep South.

Years ago, S. A. Camp, founder of the farm organization that bears his name, had a 20-acre patch of cotton in Cherokee Coun-

From this modern farm headquarters, complete with its own radio tower, go orders for cultivating and harvesting crops on land once covered by sagebrush





Rig moves wheat seed to the hopper of a plane. Seed is sown in broad swaths from altitude of 25 feet

ty, S. C. His son, Jim, even as a boy, used to be in charge of the irrigating. It was simple. Jim would stand at the end of a row of cotton and his sister would turn water down a ditch. When the water reached the end of a row, Jim would wave his cap. Then he and his sister would move on to the next row.

In 1923, S. A. Camp moved his family to California. A brother, W. B. Camp, had preceded him to the West Coast. The Camps started raising cotton in California, then turned to other crops and more land. In 1934 another brother, Claude, arrived. Out of the migrations grew the Camp company, one of California's most extensive farm organizations.

In 1950, word reached California of vast areas of Idaho sagebrush land being opened to irrigation with water pumped from wells. Jim Camp flew from California in his private plane to have a look, leased 320 acres

and soon had sprinklers operating. That first pilot farm pointed the way to bigger possibilities.

The Camp company promptly purchased 11,000 acres and began the big job of readying the raw land for irrigation. Today there are 5480 acres under sprinklers and the rest of the farm, except for a few rocky buttes which Kerbs explains are good only for Indian smoke signaling, will be completely irrigated by 1954.

Years ago the hoe and liniment for aching back muscles were considered primary equipment in removing sagebrush. But the Camp crews used fire. That didn't get at the roots, but weighted disks did.

Should the land be leveled for ditches, or left with its lava-flow trails, formed a million years ago, and irrigated with sprinklers? The value of sprinklers rises with the hills on land, but there were no hills of consequence on the forming farm, and

Almost all the farm's vehicles are radio-equipped, and a mired pickup gets quick service from the wrecker





Mrs. Anderson is the voice of the farm, for she manages its radio station and relays telephone calls

many farmers on surrounding acres had leveled for ditches.

Jim Camp examined the soil carefully. The good earth was there—in fact, none came finer. But it was shallow, in some places no more than 10 inches deep. Camp began ordering sprinkler pipe by the mile.

Today there are 51 miles of pipe on the farm—34 miles of 4-inch lateral line and 17 miles of 6, 7 and 8-inch main line. When all the farm is irrigated, more than 100 miles of pipe will weave patterns of steel and aluminum across the land.

Farm machinery was trucked out wholesale, but among the hundred or so different

items there was not a single plow, the very symbol of farming. The Camps just don't believe in plowing. Their theory is that top-soil should be worked—not turned. The working of the earth is done with deep tillage and offset disking.

Camp equipment not seen on the average farm is a road grader. The Camps are modern pioneers on a big scale, and so far they have carved out on their Idaho farm 47 miles of roads. Twelve miles are graveled. Road maintenance is a continuing project.

As the land was readied for water, wells were sunk—30 of them to date—to supply it. A man gazing across the dusty Idaho plains would say there is no water nearer than the Snake River. That's what the pioneers said as they rocked along in covered wagons. But the water was right below their creaking wheels, about 240 feet down.

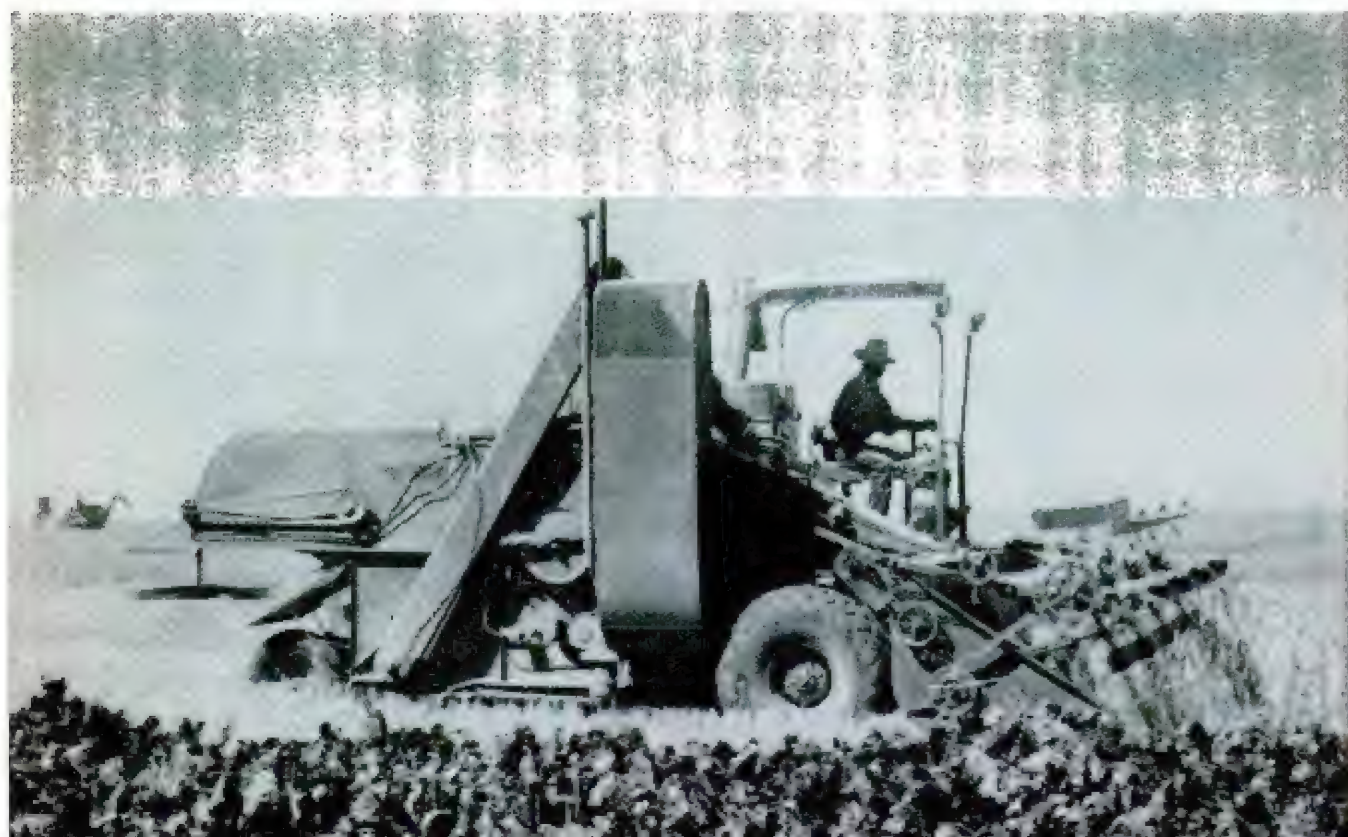
Sinking wells is relatively simple. Only 6 to 12 feet of casing are required. Below this level is lava rock—natural casing formed by prehistoric volcanoes.

But don't get the idea that bloom comes to the desert cheap. Installing a well, pump and sprinkler system on each 320-acre unit costs upwards of \$30,000.

The sagebrush land itself used to be cheap but it's going up. Sold several years ago for \$10 to \$20 an acre, it was considered good only for cattle and sheep. Some of the acres had once been cleared for dry-land wheat farming, but the drought came and the sage grew again.

Now, with water to be tapped below, the raw land is generally selling for around \$75 an acre. One man with a total of 1800 acres

Harvester moves along edge of a big wheat field, once desert land, which was seeded and fertilized by air





Sprinkler system stretches as far as eye can see. There are 51 miles of pipe now, eventually there'll be over 100

(choice) is asking as high as \$150 an acre.

Although the soil is more of the stuff that has made Idaho agriculturally significant, it needs fertilizer the first year and each succeeding year.

The Camps first tried application of liquid fertilizer through the sprinkler system on 400 acres. This worked on the test plot, but when the Camps started thinking in terms of thousands of acres they turned to the airplane.

Coverage was complete, even and fast. Not only was application greatly speeded, but planes could race over land too wet for operations with ground equipment. On land that was to grow wheat instead of sagebrush, flying crews showered down 300 pounds of fertilizer (21 percent sulphate of ammonia) to the acre. On prospective sugar-beet land they dumped 800 pounds to the acre. On potato land, 850 pounds to the acre (136 units of nitrogen and 170 units of phosphate).

"No different from crop dusting," said one of the pilots who flew up from Bakersfield, Calif., to do the job.

Planes are also used for planting grain crops. Flagmen on the ground signal where the runs are to be made, and the low-flying planes hew to the line.

Last fall visitors looked over one field of ripe grain nodding for the harvesters to come and get it. The field was in two shades of brown, for midway in the planting the type of wheat had been changed. Any overlapping where the two types met? Where there was, it was a matter of inches, yet the swaths seeded by the planes are from 24 to 60 feet wide, depending on the length of the runs. Sometimes one run is a mile long. The average height flown during seeding is 25 feet.

With three planes in operation, 3100 acres of wheat were sown in two weeks. Thirty-one tractors (including some rented equipment) crawled across the land to keep up with the covering job.

How are the yields running on the Camp farm? Sugar beets, 20 tons to the acre; wheat, 50 bushels; potatoes, 300 sacks. The 1200-acre crop of potatoes, incidentally, is believed to be the largest ever grown by one operator. "Twenty years ago we couldn't have done the job," says farm superintendent Melvin Parr. "But, with airplanes and sprinklers, we have a fighting chance. Our main problem these days is

Manager Kerbs checks one of farm's 30 wells. Well, pump and sprinklers for 320-acre unit cost \$30,000





Superintendent and four mechanics in up-to-date farm shop keep the 22 tractors and other equipment rolling

getting enough experienced help, especially to handle the sprinklers. Where the sprinklers are properly controlled we get better and bigger yields. But it takes a good—and conscientious—man to keep moving those sprinklers.”

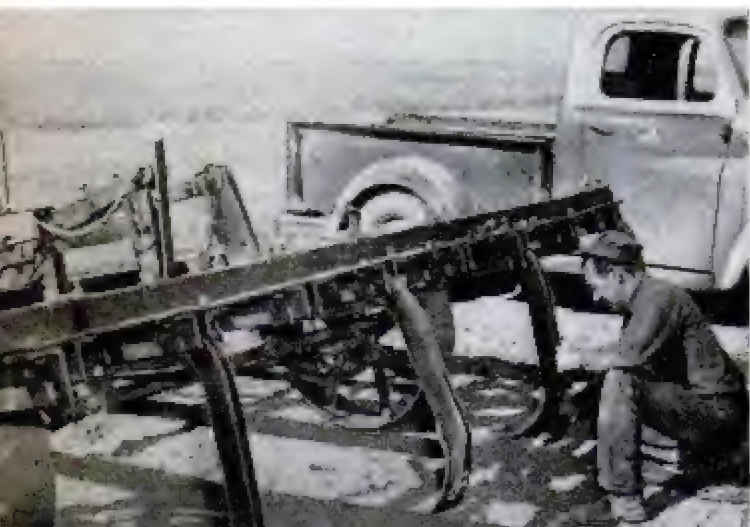
The Camps still talk about one superman they had. He would still be there, only he was young enough for the draft to pluck him off. Just turned 18 and on the skinny side, he showed up one day and said he knew all about sprinkler systems.

A man ordinarily is put in charge of four lines of 1320-foot pipe. He is expected, on the average, to move just one of those four lines every 1½ hours. The young man went to work with a will, but came in that night grumbling.

“I’m soft—too slow,” he said. “Worked as hard as I could, but it took me a full two hours every time to move all four of those lines of pipe.”

During the rush seasons—spring and fall—300 to 350 persons are employed. About 100 are on the job the year ’round. There are six full-time foremen.

Request for on-the-spot repair for deep-soil tiller goes out by radio, brings a maintenance man to field



Most of the employees live in surrounding towns and on other farms in the area, but to assure housing for workers, three 10-unit apartments have been constructed in the center of the farm.

On most farms, things move fastest in the fall when harvest time is crowded by the prospect of frost. But for real activity, take the Camp farm in the spring. Readying equipment and the land, cutting seed potatoes and drilling sugar beets all are jobs that must be done in a hurry.

Maintenance of equipment is a big job in itself. Four full-time mechanics are kept busy at it.

The superintendent of maintainance is genial, capable Claude Camp. He is only member of the family who makes the Idaho project a full-time job. He came up from California on a raw February day.

“Hadn’t seen snow since ’32,” he said. “Then up here I saw 18 storms in a row before a chinook came over the hills and took the snow off like a big eraser. That’s when we began to move fast and we haven’t slowed down since.”

Claude has a huge shop on the farm, operated by mechanics who could just about turn out a tractor on the spot if they had to. One day last summer, farm manager Kerbs came in with a Plymouth coupe. Because of high ridges on some of the roads Kerbs had just torn off the oil pan—for the fourth time. Claude studied the situation, then told a mechanic to install Dodge springs on the Plymouth. The coupe now resembles a giant jackrabbit leaping across the farm, but it rides high enough to clear the ridges.

The biggest problem in maintenance is getting needed parts in a hurry. “We couldn’t swing the maintenance out here without the radio system,” says Claude.

That system cost about \$15,000, but it pays dividends every hour. Mrs. Anderson, the soft-voiced radio dispatcher and office manager in the headquarters building, is the wife of a Rupert produce buyer, and a former farm girl who speaks the language of the men out on the big spread. Early in the day she radios to the various stations—permanent and mobile.

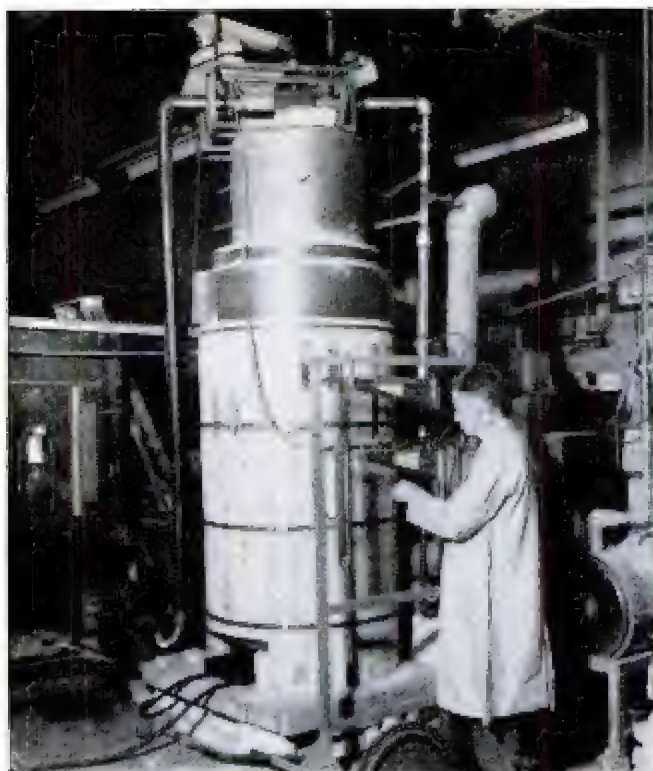
“Supply truck going to town. What do you need?”

The answers: Tractor ball gasket . . . starter switches . . . harrow teeth . . . hot patches . . .

Mrs. Anderson relays the messages to the supply truck, sometimes catching the driver as he is rolling to town or parked in front of a Rupert implement store. There are dozens of emergency calls during the day.

“Somebody,” said Mrs. Anderson, “is forever radioing for the ‘A-frame.’”

A-frame is farm nomenclature for the
(Continued to page 280)



Screened clay particles feed into top of vertical furnace, melt as they fall through 2700-Fahrenheit gas-air flame. Gases produced inside the tiny melted blobs change them into hollow spheres by end of fall

Individual particles are almost spherical. Not much bigger than grains of sand, they are much smaller and more uniform than those of standard aggregates

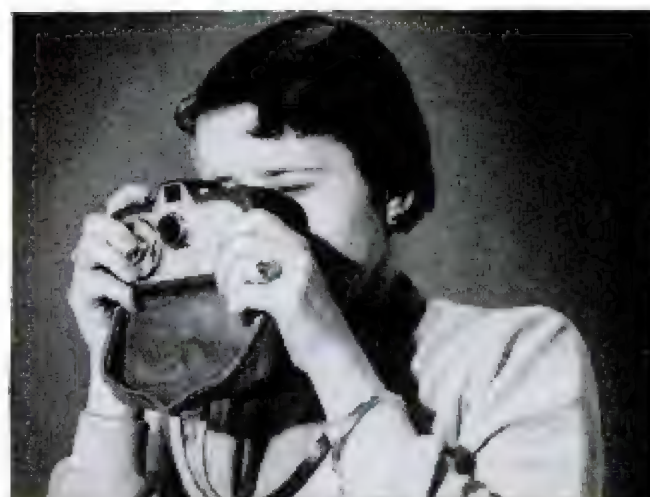
Tiny Glass Balloons Form Strong Aggregate

Concrete mixes using a new manmade aggregate are so fluid they can be pumped through rubber hoses when comparatively dry. The aggregate, consisting of clay particles formed into tiny glass balloons in the fiery atmosphere of a special furnace, has many applications in the construction field.

Concrete, mortar and plaster using the material in place of sand are strong, light and possess good insulating properties. Remarkably uniform in size, the particles are much smaller than those of expanded aggregates often used, and will allow the use of thinner wall plaster and plasterboards.

German Movie Camera Held Horizontally

Held in a horizontal position like a still camera, a new German movie camera is said to give the photographer a better grip, assuring clearer pictures. It is an 8-mm. model and holds 25 feet of double film, taking 50 feet of movies. One winding of the spring provides 30 seconds of continuous operation. The camera, which weighs about 35 ounces, is made by Zeiss Ikon.



Glass-Fiber Storm Panel Resists Hurricane Winds

Hurricane winds ranging up to 135 miles per hour aren't strong enough to damage windows protected by a reinforced glass-fiber storm panel. Only $\frac{1}{16}$ inch thick, the translucent sheet is "buttoned" to the window by means of fasteners mounted on the frame. There is no hardware on the panel itself; no tools are needed for quick installation when a storm is brewing. In tests at the University of Miami, artificial winds and gusts were directed against the panel. Coconuts, shingles, roofing tile and water induced into the air stream failed to damage the panel or the window behind it.





Modeling Plastic For Artists and Amateurs

Made in several colors, a Vinylite resin-base modeling material is nonsticky, yet soft enough for small hands to work. The material is suitable for children as well as artists. Baked for about 15 minutes in an ordinary kitchen oven, sculpture is pre-

served in durable, permanent form, with no danger of cracking, according to the manufacturer. Young artists' kits containing several colors and simple modeling tools are available in addition to bulk lots for schools, hospitals and studios.

Scenic Wall Panel for Future Rocketmen

Appropriate wall decoration for junior spacemen is provided by a kit which depicts a party of earthmen against the jagged craters of the moon. Two 49-inch panels, each two feet high, form the basis of the design. Eight smaller pieces show the

Earth (as it might look from the Moon), Saturn, and six rocket ships streaking through space. First step is painting the wall dark blue. Stars are then daubed on with a small brush dipped in white paint, and the panels are applied like wallpaper.





Compact carrying case holds both units. Remote unit, always open, has combination microphone and speaker

Two-Way "Chatterbox" Keeps Constant Contact

You can talk back and forth with a sick youngster upstairs in bed while you're wandering around doing chores downstairs, maintain contact with kids when camping or picnicking in the woods, or keep up a two-way conversation on two-man jobs when you're on the roof and your partner's in the cellar. The secret is a portable 8¾-pound intercom set that works on batteries and will function at distances up to 1000 feet. Two units are enclosed in a carrying case along with lengths of the connecting wire. The instrument is so sensitive that it will pick up and transmit conversation even though the talkers may be 50 feet away from either unit. A control panel on one unit regulates sensitivity and contains a "speaking" and "listening" switch, but the remote unit needs no switch-over for receiving or sending and is ideal as a baby-sitter.

Controlling unit mounts "listening" and "speaking" switch. Unit at other end is equipped with buzzer



If you do not find the information you need in the WHERE-TO-FIND-IT INDEX, starting on page 12, sources of further information are available without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario, Chicago 11



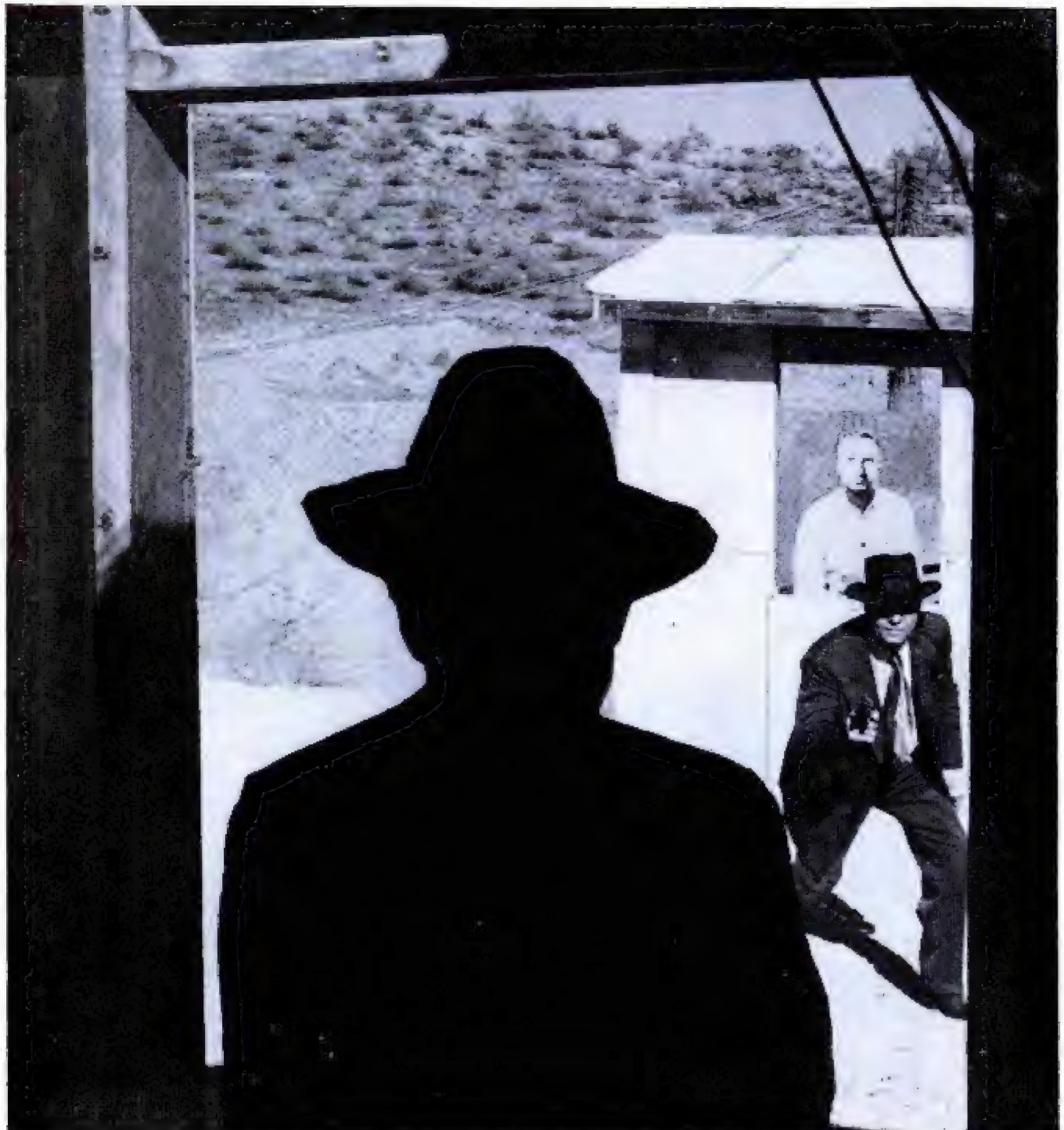
Telephone Holder

Your telephone is held for you by a pivoting arm that leaves both hands free for note taking while you talk. The jointed arm holds the instrument in any position. You never have to return the handset to the cradle. By a pull, the arm connects the telephone into the circuit. When finished with the call, you push the handset back out of the way and it automatically disconnects. Installation is simple. You place the instrument on the base and clamp the handset to the end of the pivoting arm.

"The Law" fights it out with
pistol-packin' pop-ups in this

BAD-MAN'S GHOST TOWN

by Charley Niehuis





Hogan's Alley in the Phoenix Pistol Academy is made of false-front buildings with surprise pop-up targets

WILD BILL HICKOK, Wyatt Earp, Bat Masterson, gun slingers all, who brought law to the Old West wouldn't have been a match for the average cop who walks the beat in Phoenix, Ariz. "The law" of this Southwestern city is a skilled gunman who can match drawing speed and shooting ability with the best of them. It is all due to an intensive training program in revolver, rifle, shotgun and tommy-gun shooting. This program is the result of an incident that occurred to Earl O'Clair, chief of police.

One night in the early '30s while Earl O'Clair was still a patrolman and on special assignment, he heard a strange conversation on his car radio. Two fellow officers in another prowl car had captured two men in an alley. The suspects had been in the act of committing a robbery when jumped by the officers. Through a bit of carelessness, the robbers got the drop on the arresting policemen. Cleverly enough, however, one of the policemen managed to turn on the car radio to broadcast. The conversation between the captured officers and robbers was picked up and radioed to fellow policemen cruising in the vicinity.

It was this conversation that Earl O'Clair heard. He drove into the alley where his fellow officers were being held captive, jumped out of his car and opened fire, killing one of the outlaws and putting wings on the other bandit's heels.

Later when Earl O'Clair became chief of police he immediately initiated a pistol-shooting program which would make the skill of every policeman superior to law-breakers. He was helped in this program by Earl Dean, one of the nation's best pistol shooters.

The Phoenix Pistol Academy, as it is

called, is located in a saucerlike basin surrounded by desert foothills and is not far from Arizona's capital city. Trusty labor from an overcrowded city jail did most of the work. Policemen, too, in their spare time helped with construction and supervision of prisoners. A small-arms shooting range, the envy of every city law-enforcement group in the nation, is the result.

The benefits of this gun-handling skill have been many. The average patrolman on the Phoenix streets is a small-arms expert. It has made him a safe policeman in an emergency because he isn't "gun happy." Too, it has made him a very reliable man to have on your side of the law in combat. There is little doubt but that the word has passed through the underworld that the

Earl Dean, range officer, explains proper alignment of sights to a rookie policeman as he moves target





Gordon Selby, in trick shot, uses facet of a diamond ring to sight revolver; right, trainee uses right eye for aiming which forces him to lean out too far from shelter. Men are trained to use left eye in emergency

Phoenix cops are plenty "hot," consequently relatively few gun battles between law-breakers and policemen occur in Phoenix.

Several officers have had opportunity to cash in on their time invested in learning how to shoot a pistol.

One officer, disguised in plain clothes, was loitering in a bar. He was on special assignment. An unknown thief came in. The bandit suddenly drew his gun and attempted to hold up the place, not knowing a police officer was in the group. The plain-clothes man, at a disadvantage in being "under the gun," drew his own holstered revolver and shot the would-be holdup man.

Members of the Phoenix Police Department

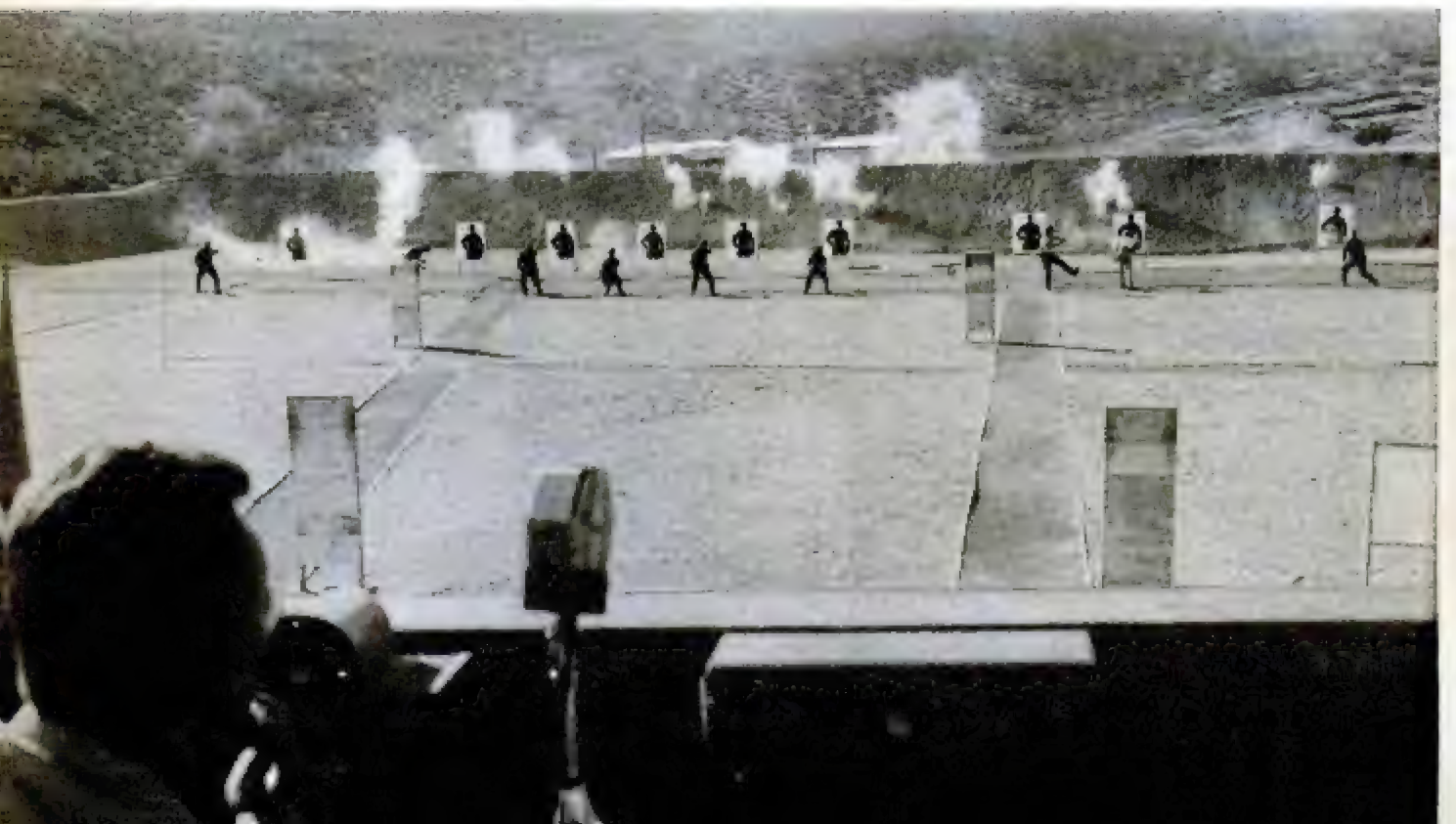
are required to shoot an average score of 65 out of a possible 100, or better. Some of the officers who are top shooters maintain a yearly average of more than 90.

These tests are passed 10 months out of 12. If at any time an officer falls below the required 65 score, he has to practice until he brings his score up above the required minimum.

Approximately 12,000 rounds of ammunition are fired each month by members of the Phoenix Police Department in practicing and passing their shooting tests. The ammunition is furnished the men, but it is handloaded by trustees from the jail under

(Continued to page 274)

Range officer, in elevated tower equipped with public-address system, watches officers practicing on range





Demountable Cabs Speed Engine Repairs on Snub-Nosed Trucks

Major repairs on the engine of a truck or tractor aren't easy when the cab rests over the engine. One manufacturer's solution: Just raise the cab out of the mechanic's way. His latest-model truck cab can be disconnected and removed in less than 10 minutes. Hold-down bolts are easily accessible,

wiring is disconnected at plugs, pipes are detached at unions. Brake and accelerator pedals are mounted permanently on the floor board, which remains in place as part of the chassis. Water connections do not have to be disturbed. Replacement takes 15 to 20 minutes.

Face Washer for Handicapped Attaches to Faucet

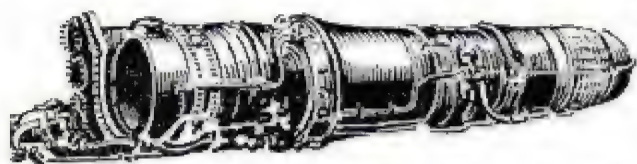


Help for the handicapped is promised in the work of Robert G. Wilson, Jr., who, though handicapped himself, has been awarded a master's degree by the Illinois Institute of Technology. Wilson, a partial deaf-mute with one useless arm, has designed a sink attachment to help the one-armed person wash his face and hand. The attachment, connected to the faucet by a rubber hose, has a water reservoir with a soft sponge on top and a brush on the side. The user moves his face across the sponge and scrubs his hands with the brush.

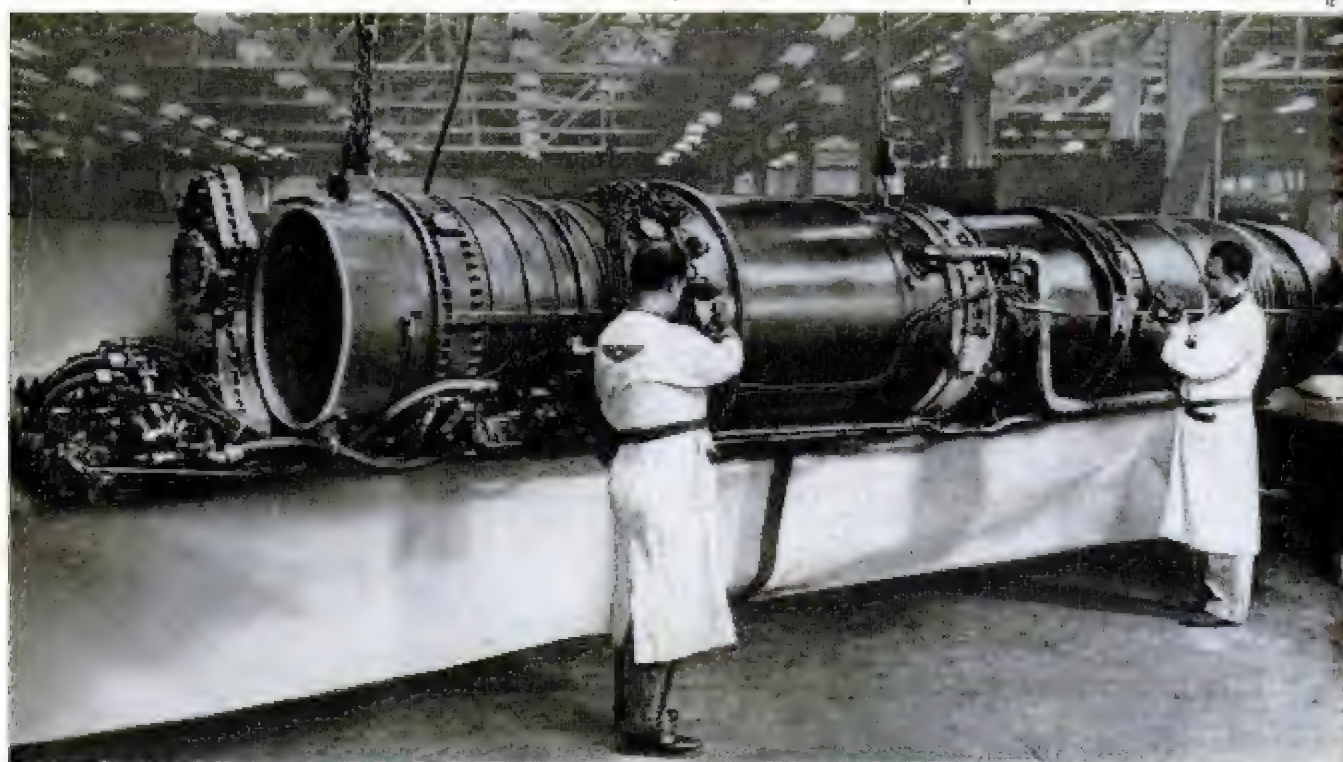
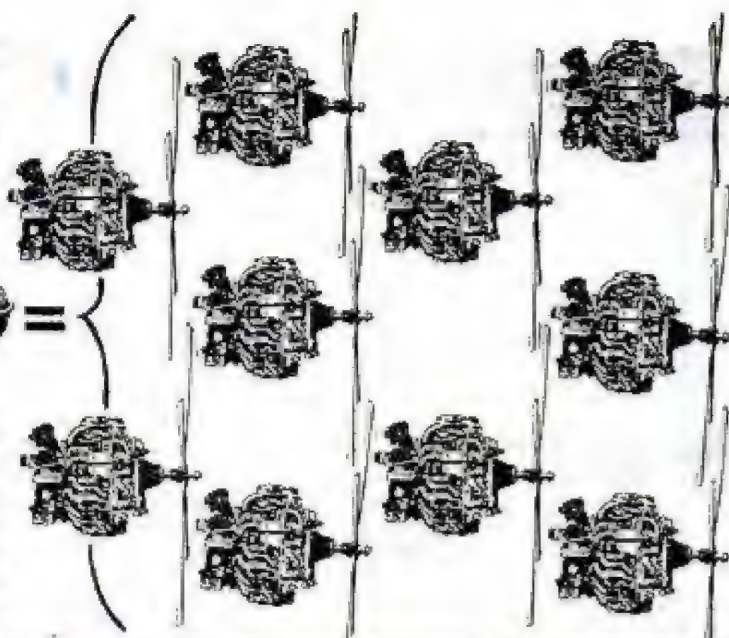
Book Riffing Helps Lip-Readers

Lip-reading students at the University of Illinois are being helped by a schoolboy stunt of flipping the edge of a book to make "moving pictures." On each page is a picture of the same face, but with the mouth changed progressively as in saying a phrase such as "we saw the show."

Power of Jet Engine Is 10 Times That of B-29



Though it weighs less, one of Westinghouse's J40 jet engines is 10 times more powerful than each engine and propeller combination on the wartime B-29s. Approximately 25 feet long and 40 inches in diameter, the 25,000-horsepower unit, below, is the first Navy jet capable of using a new low-cost fuel developed for very high flying planes



Thrust equal to 25,000 horsepower is produced by Westinghouse's new J40 jet engine. After a 150-hour test, equivalent to more than 75,000 miles of actual flight, it was described by the United States Navy as the world's most powerful qualified turbojet aircraft engine. Twenty-five feet long and about 40 inches in diameter, the J40 produces more thrust per square inch of frontal area than any other turbojet. It weighs approximately 3500 pounds, less

than the weight of the engine and propeller combination used in the famous B-29 Superforts, though it provides 10 times more power. A new low-cost fuel, especially developed for use in high-flying jets and designated as JP-4, was used throughout the qualification test. Substantial amounts of two of the most critical metals, columbium and cobalt, were eliminated in the new engine. The J40 will power the McDonnell F3H and the Douglas F4D.

Selective Chemical Kills Pond Scum

Green scum which often gathers on stagnant lakes and ponds is prevented by a chemical that kills algae. University of Wisconsin botanists report that the substance, 2, 3 dichloronaphthoquinone, is as effective as it is hard to pronounce. Only a few parts per billion parts of water pro-

duced a lethal effect on the plants in tests conducted by the scientists. Believed harmless to fish and other aquatic life, the chemical was one of 300 substances screened for effectiveness in the studies. Further tests will determine the chemical's long-range effect on aquatic life.

the

POPULAR
MECHANICS

CRAFTSMAN



JUST LIKE NEW WITH *flexible paint*

By Wayne C. Leckey

SEEING IS BELIEVING and certainly so in the case of a new flexible paint. For the way this amazing finish brings new beauty to shabby and soiled leather articles is truly unbelievable. You can take an old suitcase, so badly scuffed and worn you wouldn't be seen with it, coat it with sealer and two coats of tan flexible paint and you'll have a smart piece of luggage that wears and looks just like new.

Differing from ordinary paint, although it is applied in the same way, flexible paint, as its name implies, will not crack or peel when applied to leather, leatherette and canvas. It contains a special long-lasting plasticizer that replaces the natural oils in dried-out leather and the castor oil in leatherette. It loses 80 percent of its weight upon drying, leaving a durable, nonbleeding finish as flexible as the leather itself which resists mildew and alkalis, heat and cold, salt air and alcohol. What's more,



Flexible paint will make the top of your station wagon, as well as its interior, look just like new



Partially painted luggage and brief case show what can be done to renew badly scuffed and worn leather



Above, keeping baby shoes white is easy when they are painted. Dirt and grime cannot embed in leather. Below, steps in repairing rip or burn in chair seat

it dries in a hurry—the housewife can paint a chair, for example, and within 2 to 3 hr. the chair will be ready for use. When you tire of the somber color of leather-covered furniture, it's a simple matter to "reupholster" it in another color and when the finish gets soiled, it can be washed.

Far from limited to just leather goods, flexible paint can be used to renew faded canvas awnings, hammocks, beach chairs and life preservers. It excels as a waterproof topping for canvas-covered boat decks where ordinary deck paint soon cracks and peels under exposure to sun and salt air. The leatherette seats and backs on the chairs of a dinette set may be made to look like new. Dried-out and scuffed leather chairs, stools, breakfast booths, hassocks, camera cases, golf bags, baby buggies, table pads and brief cases, footballs and football helmets, all can be rejuvenated and given new life and beauty. The continual chore of keeping baby shoes white with messy polishes is no longer necessary. By painting them either white or in colors, the shoes are cleaned quickly by wiping off with soap and water as dirt cannot embed in the leather. The color of belts, handbags and shoes may be changed overnight to suit certain wearing apparel. If you own a convertible or station wagon, you can put flexible paint to good use in brightening up worn leather-covered seats, armrests and scuff pads. It provides an excellent preservative for renewing the covering on the top of a station wagon.

There's no trick to using the paint. If the leather piece is in a badly scuffed condition, it is first sealed. This is done with a special sealer which stops absorption of porous surfaces and forms a tough, permanent base for the flexible paint. The sealer is sanded lightly before the paint is applied, two coats being recommended. A chair that might have a cigarette burn or rip in the leather can be patched easily and painted over to make the repair scarcely discernible. Such repairs are made as in the series of sketches below, first cleaning the spot with cleaning fluid and stuffing cotton in the hole. An adhesive-tape patch, with the corners rounded, is placed over the tear, after which it is coated with two coats of sealer and sanded. When the leather piece is given two coats of paint, you'll have to look closely to see the patch. ★ ★ ★

Information courtesy RamCote Products





A pleasing picture to any homemaker—the modern laundry; literally a “production line” on which a tub of clothes is washed, dried and ironed in 1 hr. The entire laundry can be done without wetting the hands

Here's Glamour for **YOUR BASEMENT**

By James R. Ward

PART 2

UTILITY, BEAUTY and ease of cleaning, plus many built-ins, are features of this recreation room, which also incorporates a modern laundry, an unusual bar, a combination radio and record player, television, etc. A glance at the two pictures on this page shows what was done with the laundry. No changing of pipes or laundry tubs was necessary; the new laundry was built around them. In fact, the tubs can be seen at the right side of the upper photo where Mrs. Ward is using her new laundry equipment. Both she and I feel that this feature alone was well worth the trouble and money spent, as it enables her to accomplish in 2 or 3 hr. a laborious job that formerly required a couple of days—washing, drying and ironing of the family laundry. She now completes the entire job on a production-line basis without even wetting her hands. The type of laundry equipment is a matter of choice. We used General Electric

Not much resemblance between the scene below and the one above, yet the laundry tubs remain in their original position





Record player slides out for loading with records. Compartment below is partitioned for record albums



If extra heat is required, this Coleman wall heater supplies it. Gas-fired heater takes no floor space



Buffet table above folds down into wall frame out of way when not in use. Pivoted braces support it

Below, small doors in bar are closed when it is to be used as a service bar or a Coke bar for children



equipment because we liked its quality and appearance and it seemed to fit best into our particular arrangement. The walls of the room are covered with Gypsum board and then painted to suit. Color is a matter of preference. Although we show it in yellow and blue, it would look well in all white.

On page 188 are spot views showing the record player, folding buffet table, Coleman wall heater and two views of the bar—opened and closed—which is built into the partition between the laundry and recreation room. Record player slides into the cabinet and the table folds down into a wood frame against the wall when not in use. The bar doors are closed when used as a service bar and opened when it is to be used as a beverage bar.

The upper right-hand photo shows the Coleman gas-fired, wall-type heater which was installed to augment the heating plant. By partitioning the basement much of the

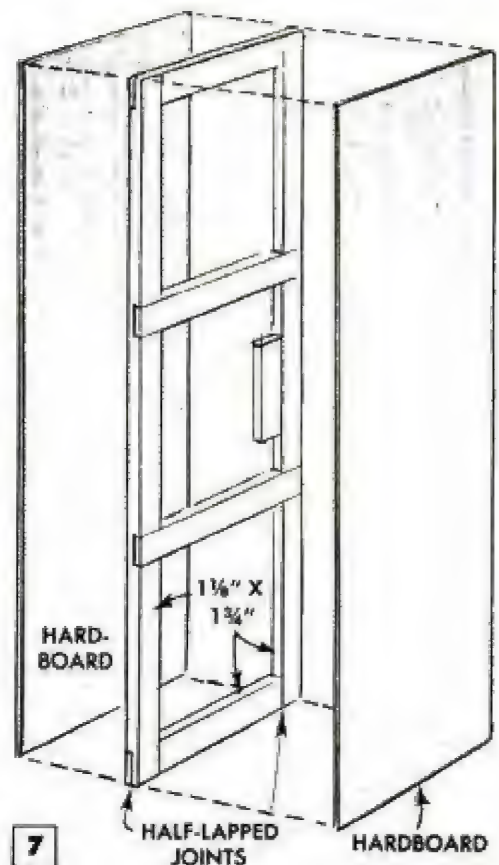
View of bar with the doors opened when Dad and Mom want to use it to serve their guests at parties



heat normally escaping into the basement from the boiler room was cut off. During very cold weather it will be necessary to have an auxiliary heat source in the room. You will find the Coleman heater just the thing for this. It fits between studs and projects only 3 in. into the room. This particular heater is a 25,000-B.T.U. unit and supplies more than sufficient heat.

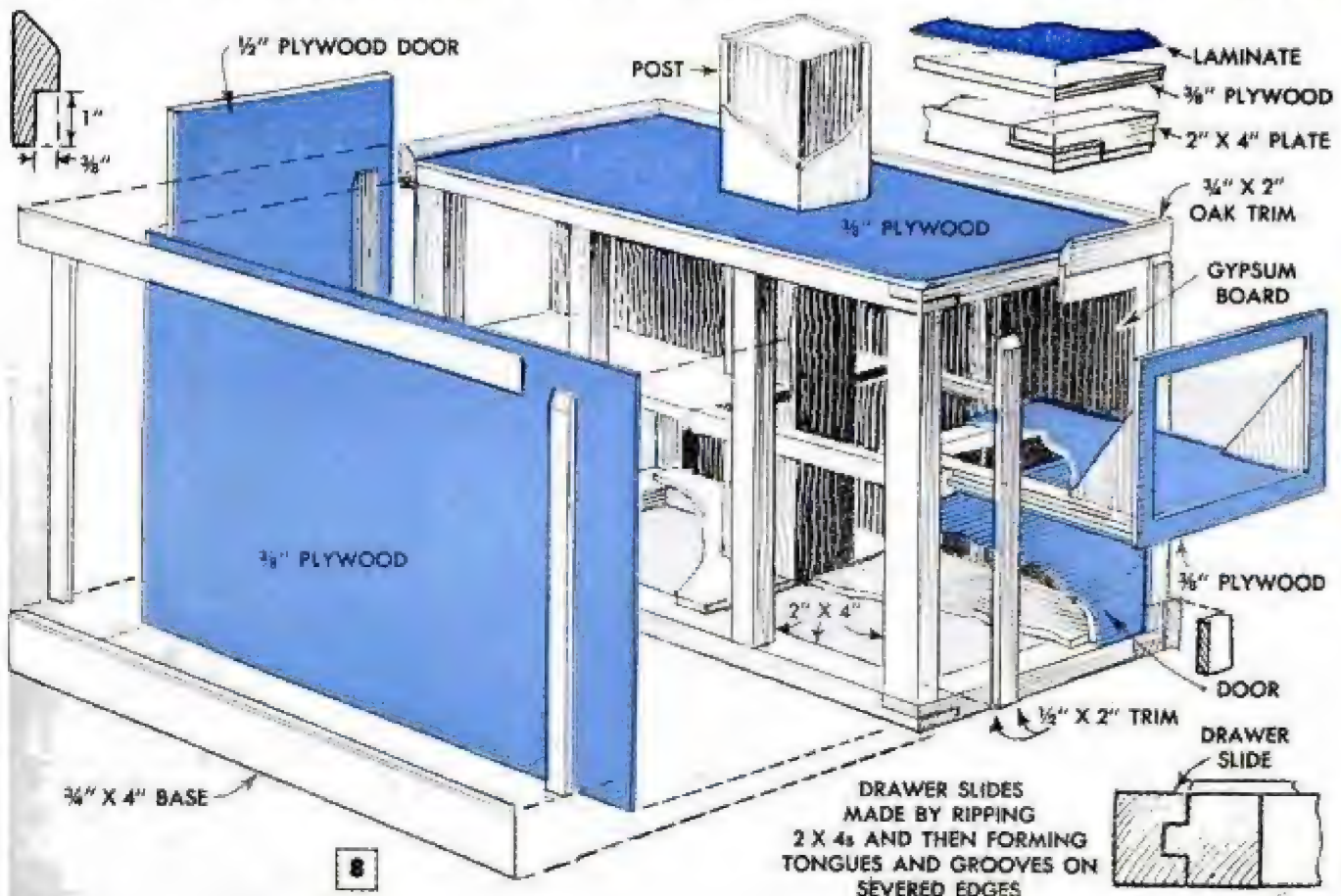
The laundry equipment is sufficient in most cases to keep the laundry warm. However, by opening the bar doors and leaving the entrance door to the laundry open, heat from the main recreation room can enter. In addition to this, as mentioned in the first installment last month, a duct was built around the enclosed hot-water heating pipes and a fan installed to blow air from the boiler room over these pipes into the laundry room. The fan, of course, is operated only when it is needed to heat the room. If desired, the fan could be wired to run each time the heating plant operates, whether it is fired by oil, gas or stoker.

In the installment last month, planning, designing and construction to the point of completing the framing were described. Framing of the cabinet, which is built around the exposed center supporting post and contains the radio-record player, is shown in Fig. 8. It has a sliding shelf at one end in which the player is set and a plywood door at the opposite end for storage. Underneath the record player is another door which is hinged at the bottom to cover a compartment containing the record albums. The front side of the cabinet is faced with $\frac{3}{8}$ -in. plywood, and both of the doors and drawer front are made of $\frac{1}{2}$ -in. plywood. The cabinet top is $\frac{3}{8}$ -in. plywood covered with decorative laminate in the same way as the bar and the counter above the book shelves. Trim around the top is made of oak and is shaped as shown in the upper left-hand detail of Fig. 8. Side of the cabinet next to the twin seat



All doors used in the recreation room were made as indicated above. Doors of this type are inexpensive, warp-proof and are very easy to assemble and fit.

Cabinet for the radio-record player is built around post and carries one end of the twin seat. It has storage door at one end and a sliding shelf that holds the record player at the other end.





View of framing before the wall covering is applied. Framing in foreground is for the double-wall partition

described last month is covered with $\frac{1}{2}$ -in. Gypsum board of the same type as used on the walls.

All doorways are of a size to suit our particular needs, the doors being made to fit them as shown in Fig. 7. First, a frame of $1\frac{1}{8} \times 1\frac{3}{4}$ -in. pine was half-lapped together and then covered with hardboard on both sides. As you can see, in the center of the frame a block was set in to take the door lock. This was necessary because of the thin sides of hardboard. The latter was glued and bradded to the framework. This produced an inexpensive, flush-type door that is strong and warpproof. Warping caused by dampness is a feature that must be considered when using doors in a basement. After the doors were completed, they were hinged in the usual manner and the locks installed. The door frames were also home-made. We did this with $\frac{3}{4} \times 4$ -in. stock, which was nailed directly to the studs on each side of the doorway. If care is taken when putting in the studs, it will be unnecessary to shim the frame to plumb it. When building the doors make them $\frac{1}{16}$ to $\frac{1}{8}$ in. oversize so they can be planed to fit the opening perfectly.

After the framing is finished and the doors made and installed, you are ready for the wall covering. Fig. 9 shows a view looking into the framed room from the partition side. This is a double wall in which are storage closets.

There are many types of covering that may be used on the walls. After considerable investigation, we picked Gypsum

board. This is easy to apply and is available in three thicknesses, $\frac{1}{4}$, $\frac{3}{8}$ and $\frac{1}{2}$ -in. It also is available with an imitation-wood-grain surface in several types of wood. Gypsum board is highly resistant to fire and wood-stud partitions covered with $\frac{1}{2}$ -in. Gypsum board are able to withstand passage of fire for about 40 min. This is an important factor when using it in your home. Also, Gypsum wallboard, when applied and the seams properly prepared, produces a wall as smooth as a plastered wall and can be painted or decorated in the same way. These factors were instrumental in our choice of this particular covering. We

First step in applying decorative laminate to bar and counter tops is to spread adhesive and let it dry





The family teamwork is going strong at this point. Olwen (Mrs. Ward) nails on fitted wallboard panel while Betty gets busy with crack filler to cover countersunk nailheads in the door and the window trim

wanted to be able to change the room in appearance by merely redecorating and also wanted a reasonably strong wall. The Gypsum board in the $\frac{1}{2}$ -in. thickness seemed to be our answer.

It has beveled edges which, when butted together, form a recess in which cement and perforated tape are applied to bring the joint flush with the surface and conceal the joint. Figs. 15 to 22 inclusive show how to install the board and how a wall looks before decorating. The board is cut by using a linoleum knife or any other sharp instrument that will score it as shown in Fig. 15.

After cutting one side, the board is bent down as in Fig. 16 and then severed completely by running the knife along the underside to cut the cardboard.

When installing Gypsum board, the ceiling should be put on first and then the walls butted up against it at the ceiling line. Nails to use for $\frac{1}{2}$ -in. board are 5d cement-coated, $1\frac{5}{8}$ in. long. If you use the $\frac{3}{8}$ -in. board, use 4d nails, $1\frac{3}{8}$ in. long. On the ceiling the nails should be spaced 5 to 7 in. and 6 to 8 in. on the walls. The nails should be driven not less than $\frac{3}{8}$ in. from the ends or edges of the boards. Sink the

Following the application of the adhesive, cover with heavy wrapping paper and position laminate in place. Next, pull out piece of paper, press the surfaces together, then remove all paper and press the laminate





To cut Gypsum board, first cut top surface with knife, then press downward to break board as below



Next, cut cardboard layer on underside with knife which produces a clean uniform break as below

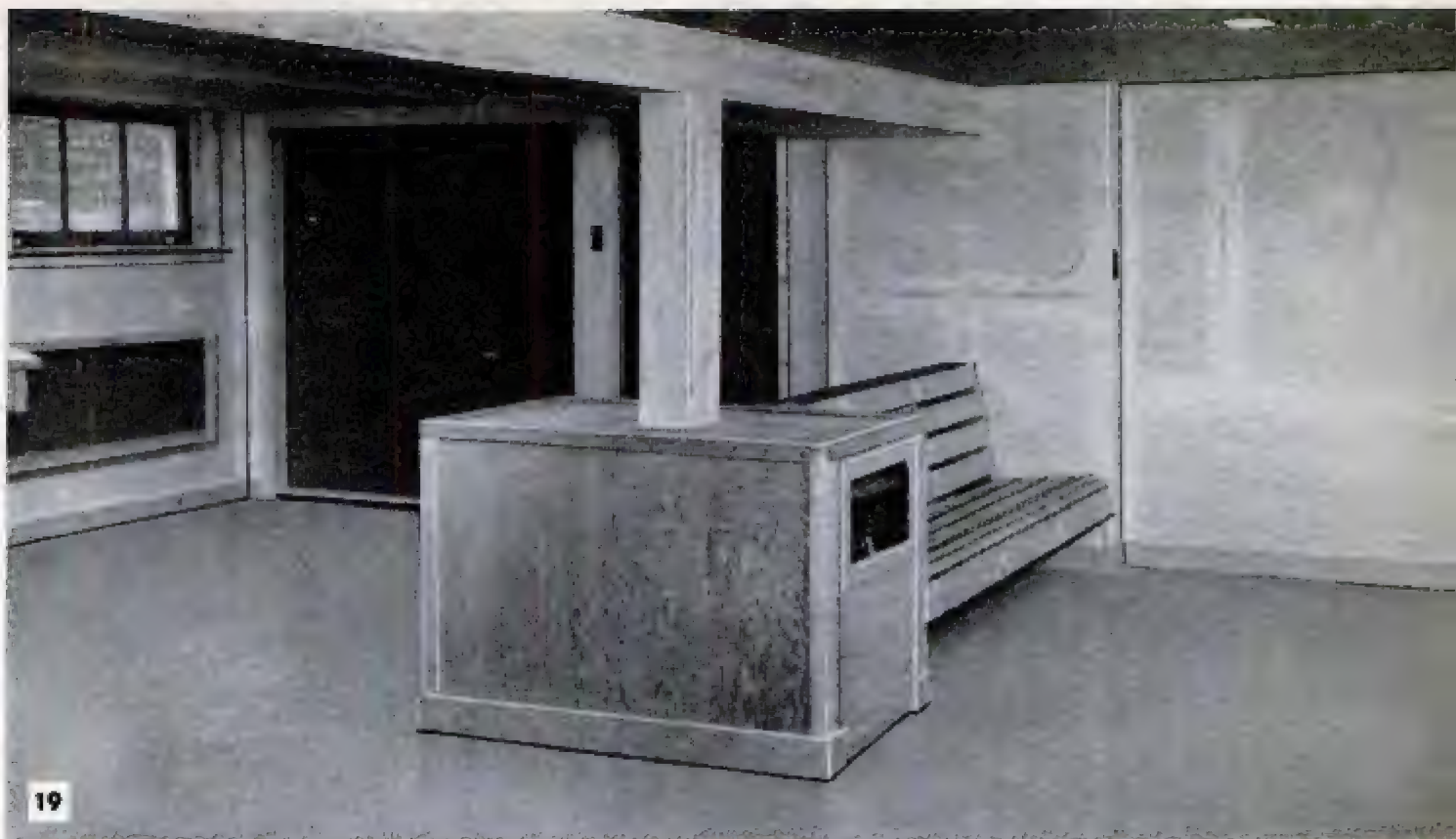


Installing large sheets on ceiling singlehandedly is done by supporting them with a T-shaped brace

nailheads below the surface by having the last hammer blow dimple the wallboard slightly, as in Fig. 22. Wood-grain board is applied with special nails and the joints are not cemented.

Fig. 18 shows how a T-shaped support is used to hold the boards against the ceiling joists while nailing the boards in place. It is desirable to use boards of a size that will permit the least possible number of joints, most of which will be the recessed-edge type shown in Fig. 21. However, when it is necessary to use the flush joint, such as when the boards have to be cut and butted together, you can treat it as shown in the lower details of Fig. 21.

The recessed-edge joint is made by first applying a thin coating of special cement and then pressing in a strip of perforated tape as illustrated in the photo and center detail of Fig. 21. After the tape has been pressed in, a thin coat of cement is applied on top and allowed to dry. Usually two coats are needed, the first coat bringing the joint almost flush and the second one bringing it flush and extending beyond the tape 2 or 3 in. on each side. In the case of a flush-type joint, the procedure is the same except that the second coat is spread about 5 in. on each side of the joint. Since the flush-joint treatment makes the finished surface slightly higher over the joint than the area surrounding it, the wider joint is necessary to prevent light reflection from showing the position of the joint. If a joint approximately 10 in. wide is feathered out well at the



The two views on this page will give you an idea of the appearance of the Gypsum wallboard after it has been installed and the joints sanded, ready for decorating. Oil or water paints of any type can be used

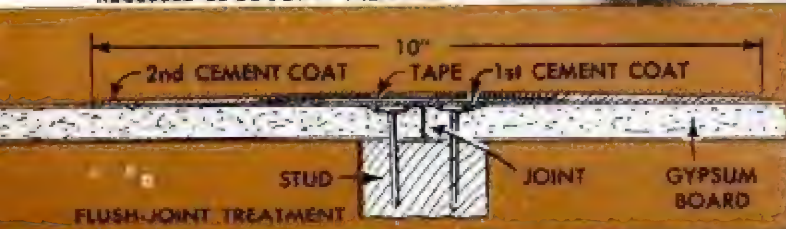
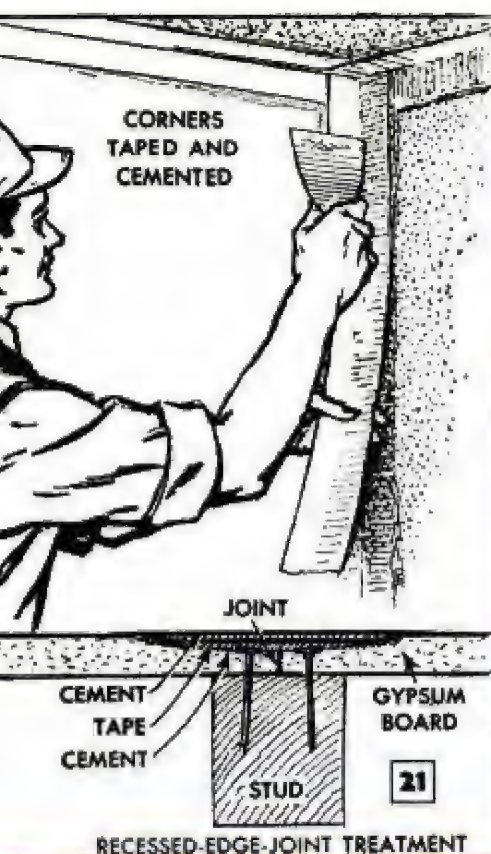
edges it will be undetectable when painted. Outside and inside corners are treated in a similar manner as shown in Fig. 21. This is also true of the joint between the ceiling and wall. Sometimes it is desirable to use molding at this point. After the joints have dried thoroughly, at least 24 hrs., they are sanded down smooth. If the cement was mixed to the right consistency and you

were careful in applying it, there will be very little sanding to do.

Be sure there is free circulation behind the walls and ceiling. If you put in a false stud wall as we did, air circulation is assured. The face edges of the floor sills are notched in about 1 in. deep and 2 in. wide in two places between each pair of studs. This will allow air to circulate up behind

Note the smooth appearance of the walls. Joints are visible only because of the contrast in color between the cement and board. They disappear when painted. Use special primer or sealer followed by two paint coats

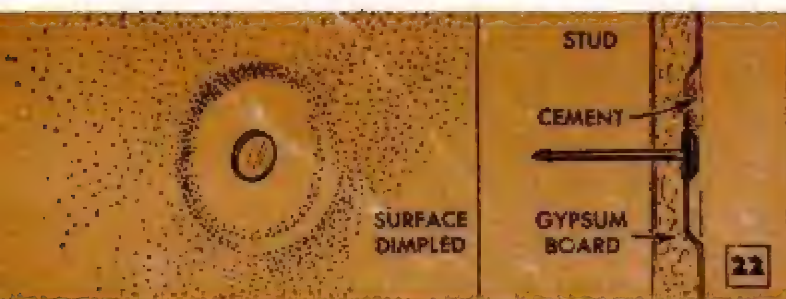




Details above show how easily the joints in the wallboard are hidden with special tape and the cement

the wallboard, across the ceiling and down on the opposite side. The wallboards should be raised above the floor about $\frac{1}{2}$ in. If furring strips are used, it may be necessary to leave an open joint between the walls and ceiling and put in corner molding to allow air to circulate up behind the walls and out around the molding. If free air circulation is not provided for, moisture behind the walls may cause mildew. This is especially true when the playroom is built in a basement. Figs. 19 and 20 show the room after the wallboard and wood trim have been applied and the joints taped and sanded ready for painting. Note the smooth

Nails not covered by joint treatment are sunk by dimpling board surface and then cementing over them



appearance of the walls. The joints and nail positions are visible, of course, because of the lighter shade of cement against the darker color of the wallboard. They will be invisible under the second coat of paint.

We used $\frac{3}{4}$ x 4-in. stock for the baseboard around the entire room and $\frac{1}{2}$ x 2-in. trim for the doors and windows. All nailholes in the trim and baseboards should be filled with a crack filler and then sanded smooth. A Gypsum-board wall must be sized with a special sealer before painting. One coat will do the job after which it is ready for paint. We used flat oil paint and applied two coats.

If a Coleman wall heater is used, it may be installed either before or after the board is applied. If it is installed after the board has been applied, you can cut an opening for it. However, at the point of installation the studs should be set 16 in. on centers as the heater is made to fit in a space of this size. Complete installation instructions come with the heater. In locating it the main thing to keep in mind is convenience of venting. If you can vent it into a chimney so much the better. Otherwise you will have to run a vent up through the roof.

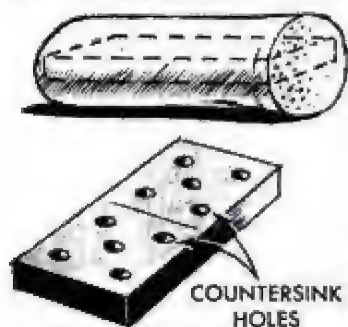
The floor is next. We used a rubber-base paint called Paratex, which is made by the Truscon Laboratories. This paint will withstand considerable wear and flows on and covers well. Two coats usually will do the job. In most cases it will be necessary to acid-etch a concrete floor before applying the paint. This treatment cleans the floor thoroughly and etches it microscopically so the paint will get a good tooth and hold securely.

Since it is desirable to cover the bar and counter tops with a tough surface we used one of the decorative laminates. These can be applied by anyone. There are several adhesives on the market for this purpose. We used one called Roltite and recommend it because we had very good success with it.

The laminate is cut with a fine-tooth saw or by scoring with an awl and then bending it upward to snap it off. If a saw is used, put the pressure on the down stroke. This will prevent any tendency to chip. The adhesive must be applied warm and all wood surfaces to be covered must be flat, clean and dry. Application is shown in Figs. 12, 13 and 14. First, brush on a coat of adhesive and allow to dry at least 30 min. Then apply a second coat. While this is drying brush a coat on the back side of the laminate and allow all coats to dry not less than 30 min. or until a piece of wrapping paper pressed on the adhesive will adhere but not stick tight. If the adhesive becomes too dry, it can be reactivated by applying another coat. Because bonding is immediate and permanent when both adhesive surfaces

come in contact, heavy wrapping paper is used as a separator to permit the laminate to be positioned properly. When in correct position the laminate is raised slightly and the paper is withdrawn 2 or 3 in. to allow a portion of the coated surfaces to contact, after which the paper is pulled out all the way. All that remains to be done is to roll the laminate firmly to assure over-all contact. Applying metal edge trim completes the job and you are ready for the many years of pleasure that the room can give you and your family. ★ ★ ★

Novel Domino Set Made From Cornstalk Pith



Desiring a set of dominoes for my youngster, I made them from the soft pith found inside a cornstalk. After cutting the stalk into sections, I peeled them and cut the pith into small rectangular pieces similar in size and shape to regular dominoes. The pieces were then sanded with fine sandpaper, after which holes representing various domino markings were countersunk with a pencil having a blunt point. Using watercolor paints, I painted the pieces black and, when dry, daubed white paint in each of the depressions. After the paint had dried thoroughly, the pieces were given a coat of varnish.—Fred Cornelius, El Paso, Tex.

Handle for Carrying Saw Blade



If you have a large circular saw blade to carry, a C-clamp of proportionate size may be used as a handle. Friction tape applied to the clamp jaws will provide nonslip surfaces, and if the handle is to be used frequently, thick felt can be taped to the clamp to make the handgrip more comfortable.

Shellac Used as Thread Dope

When kerosene or fuel oil is stored in steel drums, leakage around the threaded portions of the cocks or bungs used on the drums can be prevented by using gasket shellac as thread dope. Shellac of this type is not soluble in kerosene. Threads should be cleaned before applying the shellac.

Roger Allard, Richmond, Vt.



Rotary Tiller Speeds Digging Of Pipe-Line Trenches

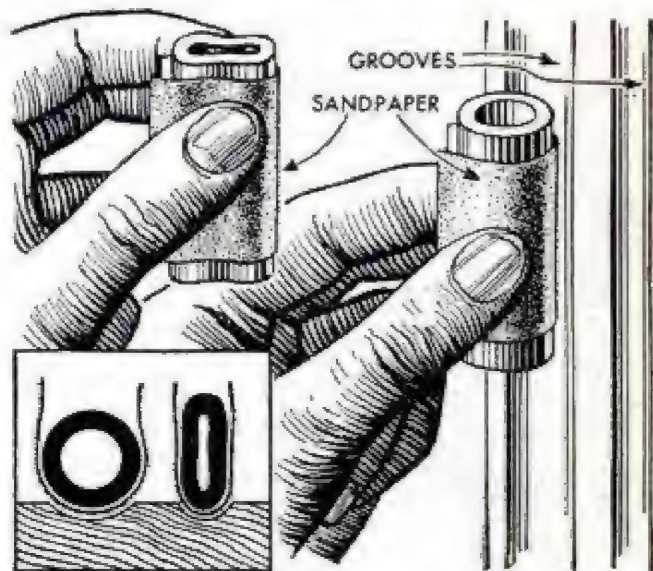
Faced with having to dig trenches for an extensive pipe line, one gardener simplified the job by using a small rotary tiller in the manner illustrated. With each pass of the tiller, soil directly beneath the machine is broken to a depth of several inches, after which the loose earth is removed with a shovel. Depth of trench will depend upon the number of passes made with the tiller.

Keith Heryford, Cedarville, Calif.

Section of Rubber Tubing Provides Round Sanding Block

A section of rubber tubing around which a strip of sandpaper has been wrapped is ideal for sanding grooves in door and window trim as well as moldings. The shape of the tubing can be varied to fit grooves of different widths simply by squeezing as indicated. For easy handling, the section should be no more than 2 or 3 in. in length.

John J. Rea, Urbana, Ill.



ILLUMINATED WALL CABINET

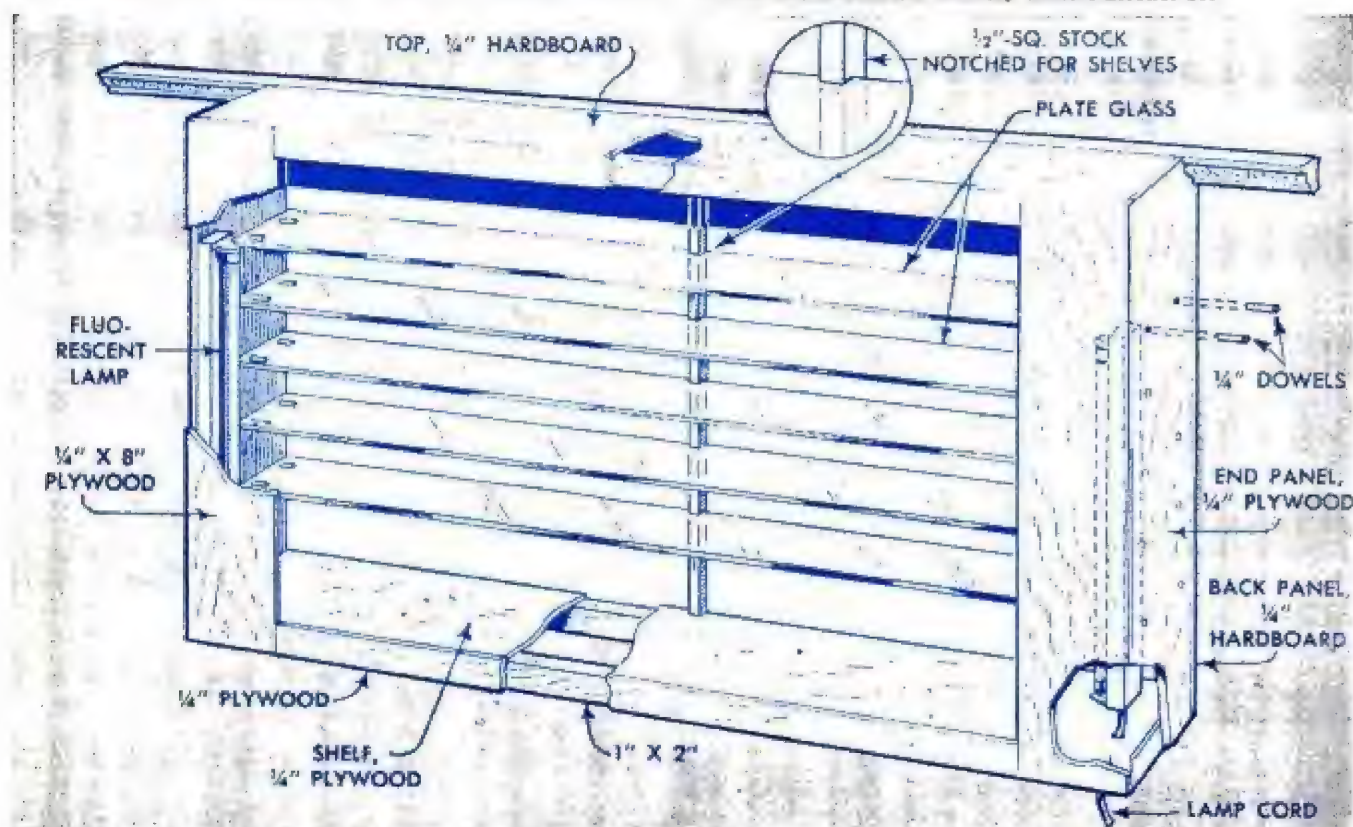


By Frank N. Stephany

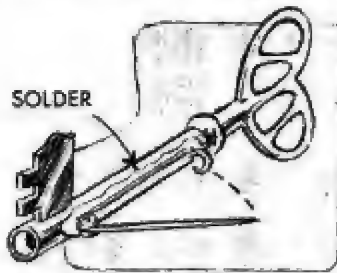
Bathed in light from hidden fluorescent lamps, your prize china and pottery are proudly displayed on the glass shelves of this unusually attractive wall cabinet. The unit affords a distinctive solution to the problem of how to "fill in" an expanse of wall in the dining room or dining area and can be adapted easily as a decorative treatment for the kitchen or breakfast nook. The cabinet consists of a plywood-covered frame, a bottom shelf of $\frac{1}{4}$ -in. plywood and several glass shelves, the latter being supported by dowels at the ends and a notched upright at the center. Fluorescent-lamp channels are installed at the sides of the front opening and wired so both lamps can be controlled with a single switch



Photos and information courtesy General Electric Co.



Old Brass Keys Make Unusual Pins



Here is an unusual lapel pin that milady can add to her collection of costume jewelry, made from an old ornamental brass key. First, clean and polish the

brass, then solder a standard brooch pin with a safety clasp to one side. Apply a coat of clear lacquer to prevent the pin from tarnishing.

Howard E. Moody, Upper Jay, N. Y.

Paper Glue-Cup Holder Made From Tin Can



To prevent a paper cup in which powdered glue is mixed from upsetting, one craftsman cut and bent a tin can in the manner indicated to provide a holder for the cup. In use, the cup is pushed down and wedged firmly between the curving prongs of the can.

Kink for Cleaning Spectacles

To clean spectacles quickly and thoroughly, spray window-cleaning fluid on both sides of the lenses and wipe with a clean cloth. This is accomplished easily since most containers for this type of cleaner include spray attachments mounted on the caps. A convenient holder for the container which can be attached to a bathroom wall is provided by adapting one ordinarily used for a lotion bottle of similar size.



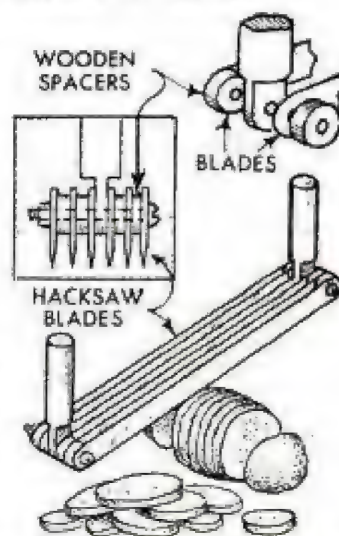
Auto-License Plates Reinforced By Hardboard Backing

By installing tempered-hardboard backings on my automobile license plates, I find they withstand bumps, remain neat-appearing longer and are easy to clean. The hardboard is cut approximately $\frac{1}{8}$ in. smaller on all sides than the plates and then drilled to correspond with holes in the plates. Both the plates and backing are attached with the regular fasteners.

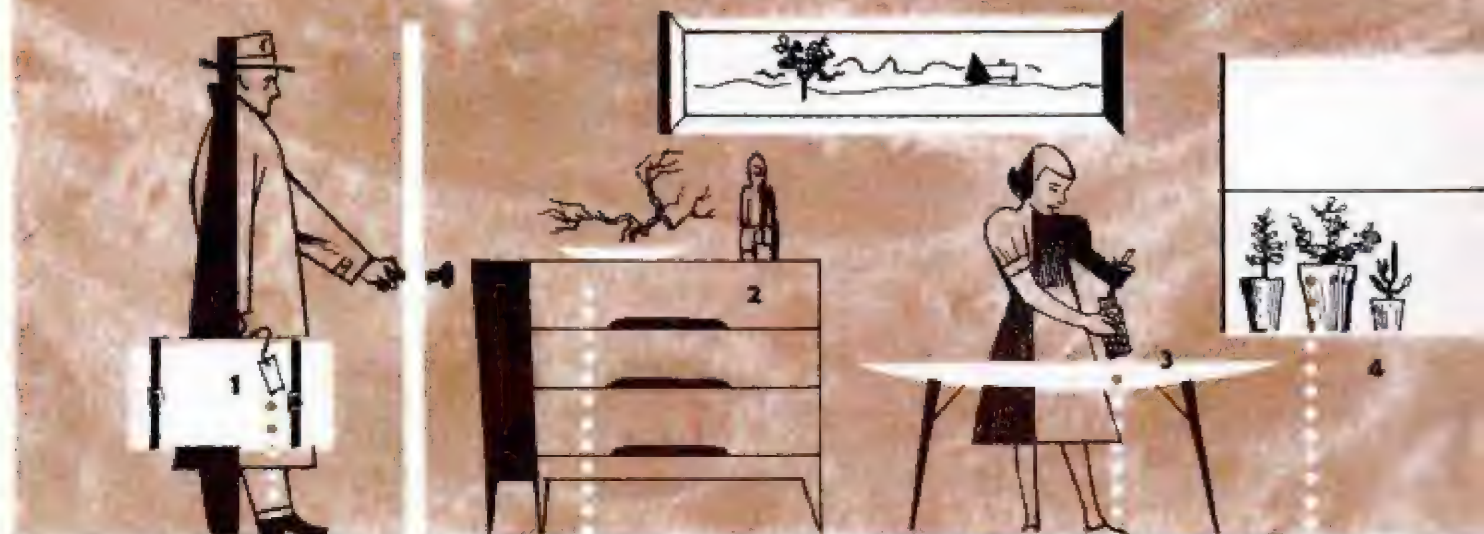
Robert Christensen, Milwaukee, Wis.

Hacksaw Blades Used in Slicer

The slow work of slicing and dicing fruits and vegetables can be speeded up with this multiple-blade slicer made from a number of old hacksaw blades. The teeth are ground off the blades and the edges are sharpened. The blades are then mounted as shown in the diagram, with $\frac{1}{8}$ -in. wooden spacers cut from a predrilled dowel placed between them. Two handles are fashioned from a broomstick. They are shaped at one end to act as spacers. The entire assembly is held together with stove bolts.—Lewis Booker, Louisville, Ky.



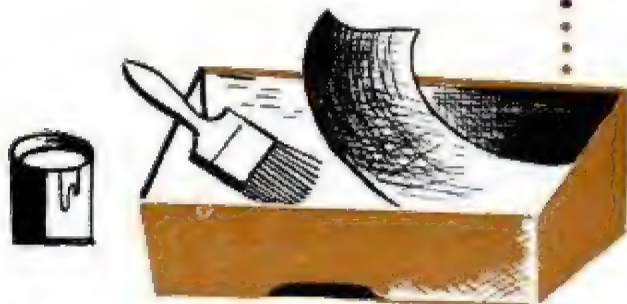
Solving HOME



1. TWIN TAGS, permanently addressed, simplify mailing and return of a laundry case. Tags are joined with a length of copper wire and one is placed inside the case, as the lid is closed, leaving one tag outside. At destination tags are reversed, the one having the return address being placed outside as lid is closed



3. KITCHEN FORK with tines bent upward nearly at right angles simplifies removal of olives and pickles from a glass jar. Bend each tine at a point about $\frac{1}{2}$ in. from the end and make sure that all tines are bent to the same angle so that points line up



2. OILCLOTH LINING for dresser drawers will stay securely in place if a thin coat of shellac is applied to the drawer bottom and the lining immediately pressed into place before the shellac sets. The lining should be cut to size and the fit carefully checked in each drawer beforehand. If there is a center support in the drawer bottom, it usually is advisable to cut two pieces of oilcloth to assure a smooth, neat fit

4. ALUMINUM FOIL makes attractive covers for clay flowerpots as it is easily shaped to the contour of the pots and stays in place without other fastenings. At the same time, the loose foil covering permits the pot to "breathe" in a manner approved by professional flower growers. Sheet of foil must be large enough to fold over rim



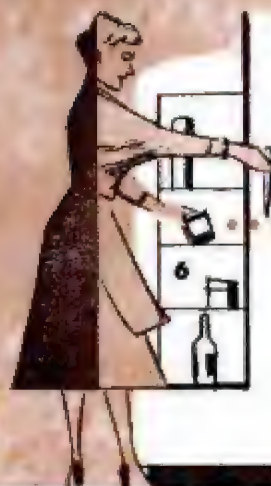
CARDBOARD SHIRT FORMS of the type used by laundries can be utilized as improvised dustpans, cutting boards for vegetables and as painting masks for window frames and baseboards. Parts cut from forms serve as inserts in envelopes when mailing photos

WICKER CLOTHES HAMPERS should be coated with shellac regularly to keep them spic and span. Shellac is best applied by spraying but may be brushed on in a fairly uniform coating if thinned with alcohol to a watery consistency. Use only fresh, white shellac

IMPROVISED DUSTER for cleaning lint from under the piano and similar furniture can be made by wrapping cheesecloth around the end of a yardstick and holding securely in place with rubber bands. A small quantity of furniture polish on pad gets dust and lint

STAINS IN CLOTHING and fabrics sent to the cleaner can be plainly marked by several stitches of white wool yarn. When possible circle the spot with a single row of stitches so that the location and extent of the spot is easily determined by a quick check

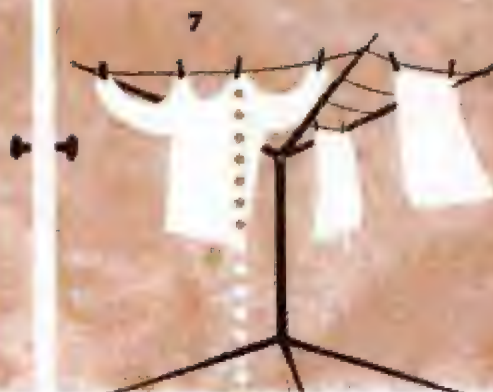
PROBLEMS



5. HOUSE PLANTS kept near a window can be effectively shielded during severely cold days and nights by wedging a piece of cardboard into the window frame so that it covers the lower half of the glass pane. Usually there is ample space between sash frame and stop to permit wedging the ends of the cardboard between the parts. If not, use adhesive tape



6. MILK CARTONS of the 1 and 2-qt. sizes make excellent storage containers for leftover foods, also for mixing small quantities of paint and as containers for solvents when cleaning paintbrushes or fabrics. On some types of cartons the top can be cut off and used as a cover. When cutting the carton down to size wanted, remember that by cutting at an angle a pouring spout is formed



7. MATCHSTICK inserted between the jaws of a spring clothespin provides a means of varying the tension so the pin may be used for holding delicate fabrics on the line without danger of marking the fabric or causing it to stick to the line. The proper position of the matchstick must be determined by trial

8. KETTLE KNOB or spool bolted to the rim of a garbage-can cover makes it easier to lift with one hand. This saves a lot of time and effort, especially on older cans where the top has been bent slightly out of round, making removal of the cover difficult without the aid of a knob. Attach the knob or the spool with a small stove bolt, drilling the hole for the bolt a little above the midway point on the flange



LIPSTICK HOLDER provides storage for such emergency items as bobby pins, straight pins, safety pins and a threaded needle. Some holders also are suitable as containers for small twist drills, tiny screwdrivers, escutcheon pins and similar home-shop items

ALUMINUM FOIL placed under the ironing-board cover minimizes dissipation of heat from the iron and speeds up the tedious job of pressing delicate fabrics. Cut the foil sheet to the same over-all size as the board and place under the covering with the bright side up

RUST SPOTS can be removed from a ceramic-tile floor with a washing solution made by dissolving sodium citrate, 1 part, in commercial glycerin, 6 parts. Add water to thin mixture, then mix with sufficient whiting to form a paste. Spread over the spot in a thick coating

MIRRORS exposed to dampness caused by moisture condensation should be protected by coating the back with white shellac. Preferably the shellac should be applied in a full-bodied coating by spraying, but two thin coats applied with a brush are fairly effective

Model-Railroad Car Painted Easily When Held With Ruler "Handle"



To hold a model-railroad car so it will not be smeared or become soiled when painted, one hobbyist slips the end of a ruler under the trucks and snaps a rubber band over each car coupling as shown to hold it firmly in place. Held in one hand, the ruler provides a convenient handle for turning the car at almost any angle for painting and inspection, leaving the other hand free for wielding a paintbrush.

G. E. Hendrickson, Argyle, Wis.

Sound of Telephone Ringing Amplified by Pan on Floor

Having on several occasions missed telephone calls while working in the basement, one resourceful housewife found that by placing the instrument in a pan on the floor above, she had no more difficulty in hear-



ing it ring. The pan amplifies the sound sufficiently to make it audible in all parts of the basement, as well as above the sound of the washing machine.

Benjamin Nielsen, Aurora, Neb.

Safe Wire-Stripping Method

To avoid the possibility of injury when stripping insulated wire with a jackknife, place the wire between the blade and the handle as shown and rotate it to cut through the insulation. Then continue to grip the wire with the knife and force the severed piece from the end.

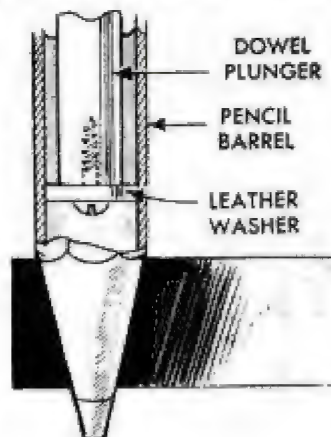
Ken Murray, Colon, Mich.



Miniature Grease Gun From Pencil

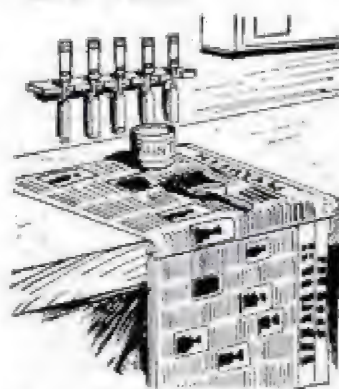
An old discarded mechanical pencil makes an excellent grease gun for lubricating model trains and boats. The mechanism is removed from inside the barrel of the pencil and a leather washer of the same diameter as the inside of the barrel is cut. This is fastened to one end of a dowel plunger. Very light grease or petroleum jelly is put into the barrel of the pencil and the plunger is inserted after it. Slight pressure will force a small quantity of grease out the pointed end of the pencil.

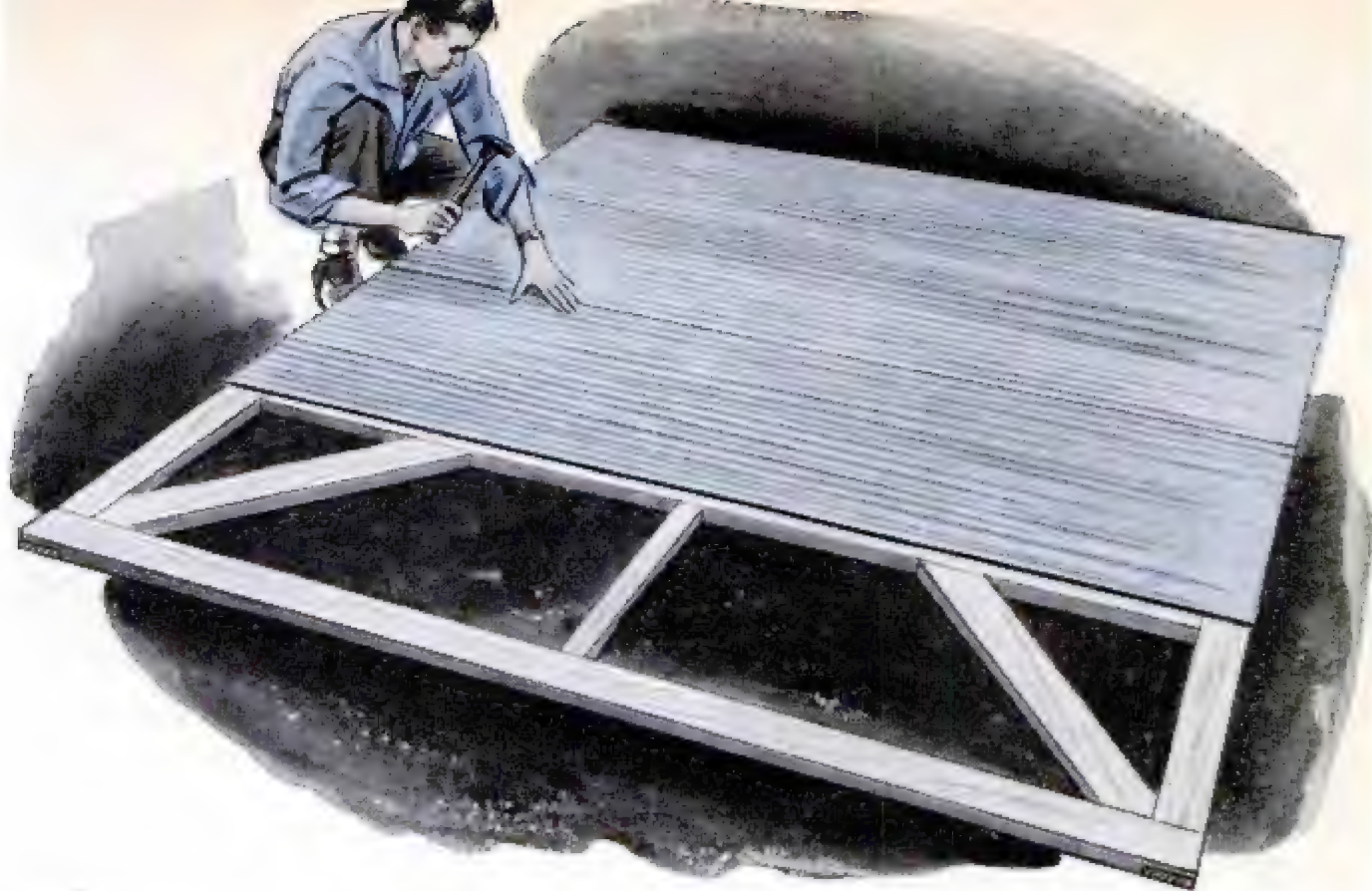
Howard E. Moody, Upper Jay, N. Y.



Newspapers Tacked to Workbench Kept Handy for Paint Jobs

Tacked to the edge of a workbench as shown in the illustration, several newspapers may be kept conveniently close at hand for covering the top of the bench while small objects are being painted. When one or more of the sheets have become soiled, they simply are torn off and fresh sheets folded over in place of them for ready use.



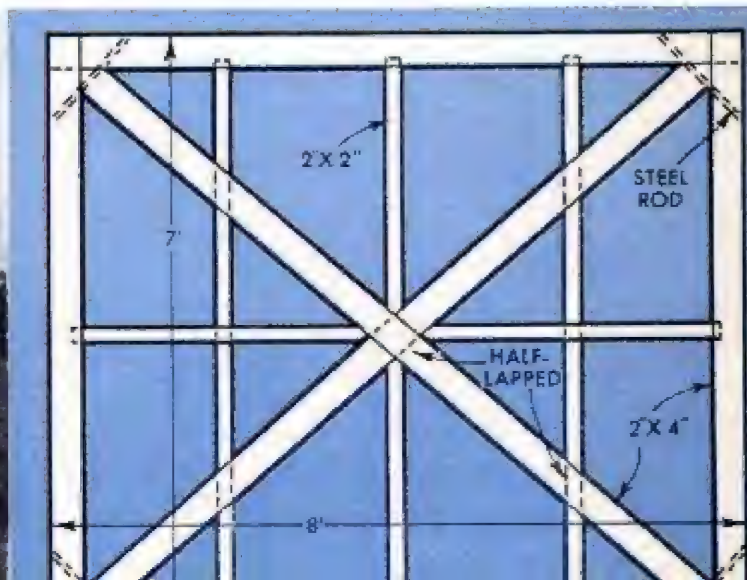


Make Your Own GARAGE DOOR

By D. C. Marshall

THE HOMEOWNER who constructs his own garage soon comes face to face with the high cost of ready-made garage doors. This cost can be trimmed substantially if he makes his own door, such as this one, faced with sheet aluminum. Sturdy and weather-proof, it will give years of satisfactory service. In building a door of this type, a strong well-braced frame is necessary. The outside members are 2 x 4s, lap-joined and fastened with bolts at the corners. To insure that the frame will remain square, 2 x 4

diagonal braces are fitted and half-lapped. The ends of the diagonal braces are held in place by steel rods that pass through the outside members and the braces. Nailing strips, to which the metal is to be secured, are 2 x 2s, mortised into the outside frame and screwed to the diagonals. To prevent mildew, the frame should be given a coat of wood preservative. Two types of aluminum sheets are available, corrugated and V-embossed. Of the two, the corrugated sheet is probably best for this purpose because it is more rigid, but either can be used successfully. The aluminum must be fastened with aluminum nails or the metal will be eaten away by electrolytic action where it contacts the nails. The inside face should be covered with either plywood or hardboard, and thin blanket insulation may be placed between the frame members. Regular door hardware is used to hang the door. Dimensions given can be varied to suit your needs.



PLASTER CASTING

From Rubber Molds

For an inexpensive hobby that will satisfy the creative urge and yet can be made profitable from the beginning, try casting objects of art in plaster

By

Arthur Paul Snader



THE ART OF CASTING in plaster is an interesting and exciting hobby that can be made profitable right from the start with an investment so small as to be no problem. Using rubber molds, you can duplicate objects of art or, for a more satisfying hobby, you can model your own carvings. Either has a ready sale through gift shops, ten-cent stores and other retail outlets.

Making the original model: The two common substances for carving original models are wet clay and plastaline. As wet clay has disadvantages, we will consider only plastaline, which can be purchased at any art-supply store. Lead or aluminum wire serves as an armature, or backbone, for an upright figure. Bend a length of wire about three times the height of the figure and twist it to form a small loop at the bend. When the distance from the top of the loop to the bottom of the twist is a little less than the figure height plus the thickness of the base, bend the ends outward to form a stand. A thin cake of plastaline is pressed onto a board which serves as a modeling stand and the end of the armature is embedded in it. Sufficient plastaline is then packed around the bottom to form the base and to anchor the armature. To finish the model, build up its general outline around the armature and then carve in the detail.

Making a "waste" mold: If you wish just

one cast, the simplest method is to make a waste mold. To make a waste mold, mix enough plaster to cover the figure to a thickness of $\frac{1}{8}$ in., coloring it with laundry bluing. Superfine statuary plaster, to which dextrine is added in the proportion of 35 grains to the pound for strength and hardness, will prove satisfactory. No. 1 casting plaster, which comes with the dextrine already added, is still more desirable. The proper mixture consists of plaster, $1\frac{3}{4}$ lb. and water, 1 pt. Sprinkle the plaster into the water through the fingers. Do not use a sifter. Wait 1 min. and stir rapidly for 10 sec. Do not beat the mixture. Next, quickly spread it on the figure, using a fairly stiff brush.

When the blue plaster has set, make a larger quantity of white plaster and trowel it on over the blue to a thickness of about 1 in. Square off the top so that the mold can be set upright during casting. When this plaster has set, scrape out the plastaline model and armature from the mold with a spoon or modeling tool. Be sure that it is entirely removed, especially noting the eyes and ears. When the mold is clear, wash the inside with a heavy soap solution, working up a good lather. Tincture of green soap makes an excellent washing compound.

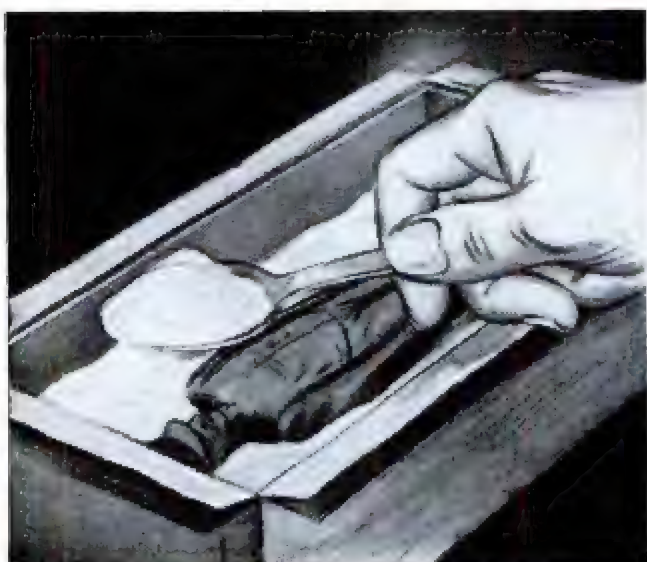
To make the casting, fill the mold with water, empty it in a mixing bowl, add plas-



Liquid rubber is brushed over carved figure to form the rubber mold. From 10 to 15 coats are needed to complete the mold. Cheesecloth is embedded in rubber to strengthen the mold and prevent buckling



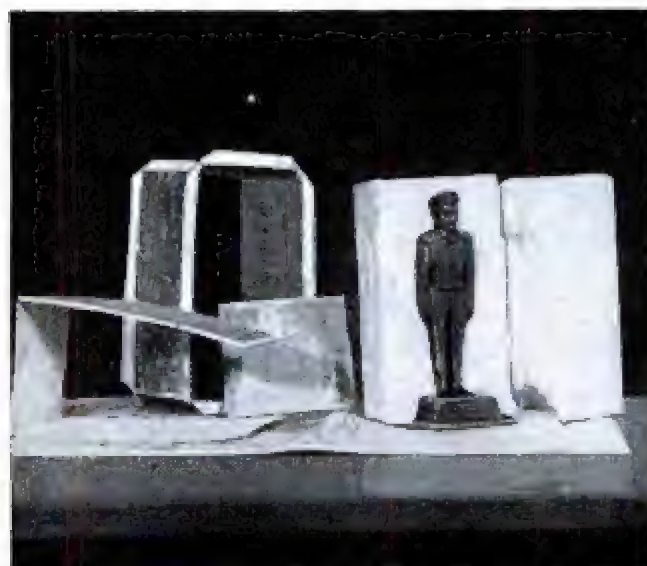
The cured mold, mounted on glass base, is shown in casting box as the clay dam is built up. When back half of mold is filled with clay, plaster will be poured into front half to make first section of shell



Above, spoon is used to make dimple on either side of figure in clay dam. Dimples will form keys to assure proper joining of mold sections. Below, the shell is taken out of the casting box and separated. The various parts of the casting box are at left

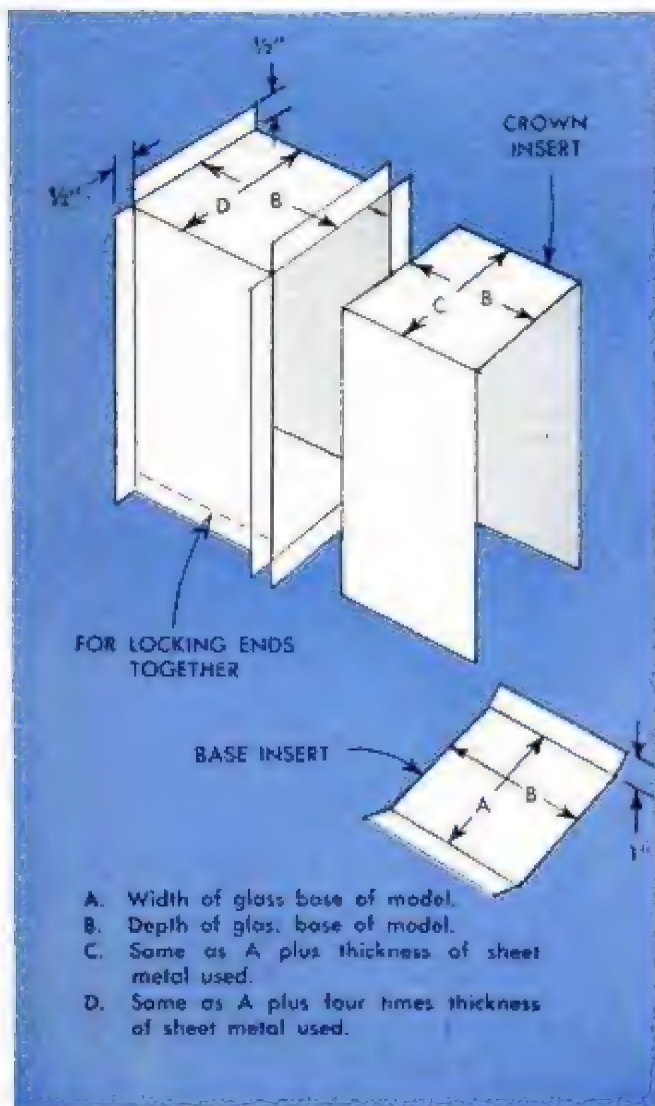


Above, after the first half of the casting shell has set and is coated with soap solution, the box is ready for pouring the second half of the shell. Below, the rubber mold has been cut from crown to base and the plastaline figure removed. Mold is now washed





Exercising extreme caution, craftsman replaces rubber mold in casting shell. Carelessness in this operation will result in "shell pinching," which will produce faulty castings. Below, construction diagram of casting box made of galvanized sheet iron. Dimensions will depend on the size of the figure



ter in the proportions already given and mix. Pour a small amount of the mixed plaster into the mold and shake. Pour the surplus back into the mixing bowl, give it one last stir, and pour the balance into the mold. Jar the mold while pouring and for a few minutes afterward to dislodge any air bubbles. Pour the mold a little over-full and then scrape the bottom flat with a spatula. Allow the cast to stand for an hour, then remove the waste mold by chiseling it away with a screwdriver and hammer. Begin at the base and work slowly and carefully. After the white plaster is removed, chip away the blue. Because of the soap film inside the mold, this job is easier than you might expect.

Multiple casts from rubber molds: Liquid-rubber compounds high in natural latex content are best for making rubber molds. You can use either a master cast taken from a waste mold or the original plastaline model for making the rubber mold. In both cases, the figure is first given two coats of shellac, thinned to about half strength. This is best applied with an oral spray, such as used by artists, but a brush can be used. Make certain that the shellac does not fill in the detail of the figure. Place a sheet of glass under the figure so it is 1 in. larger all around than the base of the model and use a small amount of liquid rubber to cement the figure to the glass. Usually 10 to 15 coats of rubber are required to complete the mold. Brush each coat on evenly and fairly thin. If, as in the model shown here, there are openings, such as between the arms and legs, incorporate pieces of shim brass in your model to prevent union of the rubber into a solid section impossible to remove. A coat of rubber dries in 20 min., and the succeeding coat may then be applied. After the second coat dries, begin laying on 1-in. strips of cheesecloth down the line along which the rubber mold is to be slit open. Brush on some rubber, lay the cloth on and brush it in place, using more rubber on the brush. The cheesecloth is applied every third or fourth coat and three layers may be applied down the outside of the arms and legs to prevent "shell pinching." In applying the rubber coats, carry each down to and out upon the glass for $\frac{1}{2}$ in. When enough coats have been applied, set the mold in a cool, shaded place and cure for a week to 10 days.

The casting box: To act as a support for the rubber mold, a casting box must be made. Light-gauge galvanized sheet iron is best for this purpose. The accompanying sketch shows the construction. In calculating the dimensions for the box, be certain that when the mold is inserted it will face the opening, not the sidewalls.

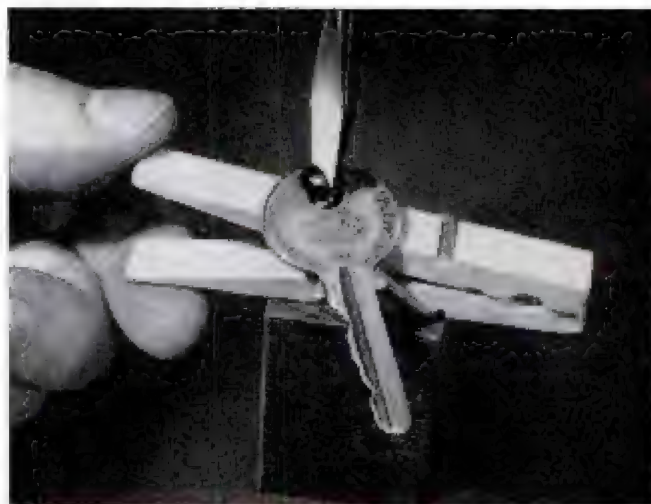
After the box is assembled, slide the rubber-covered model into it. With clay powder from the paint store, mix a stiff dough according to directions and pack it into the back of the casting box, fitting it to the sides of the box and to the contours of the figure. At this point, determine the median line of the figure and keep the clay from coming past this point. Otherwise it will be impossible to withdraw the model from the finished shell.

After the clay is packed, lay the casting box on its back and smooth out the clay around the figure. Scoop out a small dimple on either side of the figure to act as a key, so that the two halves of the mold will join properly. Fill the empty half of the casting box with plaster and allow to harden. Remove the clay and wash the half of the box that is now empty, to give it a coating of soap. Fill this portion of the casting box with plaster and allow to set before removing the casting box, parting the shell and taking out the rubber mold. With a sharp knife dipped in water, cut through the rubber mold to the model, extending the cut from the crown to the bottom of the base.

Before casting, prepare the shell by brushing it with a thin coating of floor wax and dusting it with talcum powder after the wax has dried. Wash the mold in a soapy solution and place it in the shell with the cut side up, adjusting to see that the fit is perfect. Then set the top half of the shell over the mold. Hold the two halves of the shell together with heavy rubber bands, set it upright and proceed with the mixing and pouring operation as before.

The bronze finish: To add a rich bronze finish to your casting, follow these directions: Varnish the cast and allow to dry. Give it a second coat and then blow on powdered statuary bronze. A small insect-powder blower is best for this job. Ten min. later a "craze" will appear on the surface of the cast. Spray on more powder until the craze disappears. The figure now has a modern-bronze finish. To give it an antique appearance, dissolve 1 teaspoonful of bluestone (copper vitriol) in $\frac{1}{2}$ glassful of water and brush this solution on. In about one min., using another brush, cover the figure with an ammonium-chloride solution of the same proportions. The solutions will darken the figure, with the characteristic green showing in the hollows of the cast. When dry, polish the figure with a neutral-color shoe polish of the old-fashioned wax-turpentine type. To complete the figure, glue on a felt pad using a glue without an acetone base. One last word of warning: If you reproduce art objects, be certain they are not copyrighted before you offer them for sale. ★ ★ ★

Door Key Attached to Clothespin Hidden Easily Outside House



If you frequently find it necessary to conceal a door key somewhere outside your home, screw it to the leg of a spring-type clothespin as indicated in the photo. This will make it possible to clip the key to almost any convenient projection about an entrance or porch with far less chance of its being dislodged and lost.

Holder for Steel Wool



To protect the hands when using steel wool to scour pots and pans, grip the wool in a clamp-type paper clip in the manner shown. Fold a wad of wool once and insert the ends between the jaws of the clip.

Ken Murray, Colon, Mich.

Prepare Brush Before Shellacking

Before using a new brush to apply shellac, wash it in denatured alcohol. This not only cleans the brush of loose hairs and dirt but tends to soften the bristles. Also, when the job is finished, the brush will be much easier to clean.

Blanche Campbell, Las Vegas, Nev.

SNOW SCOOTER

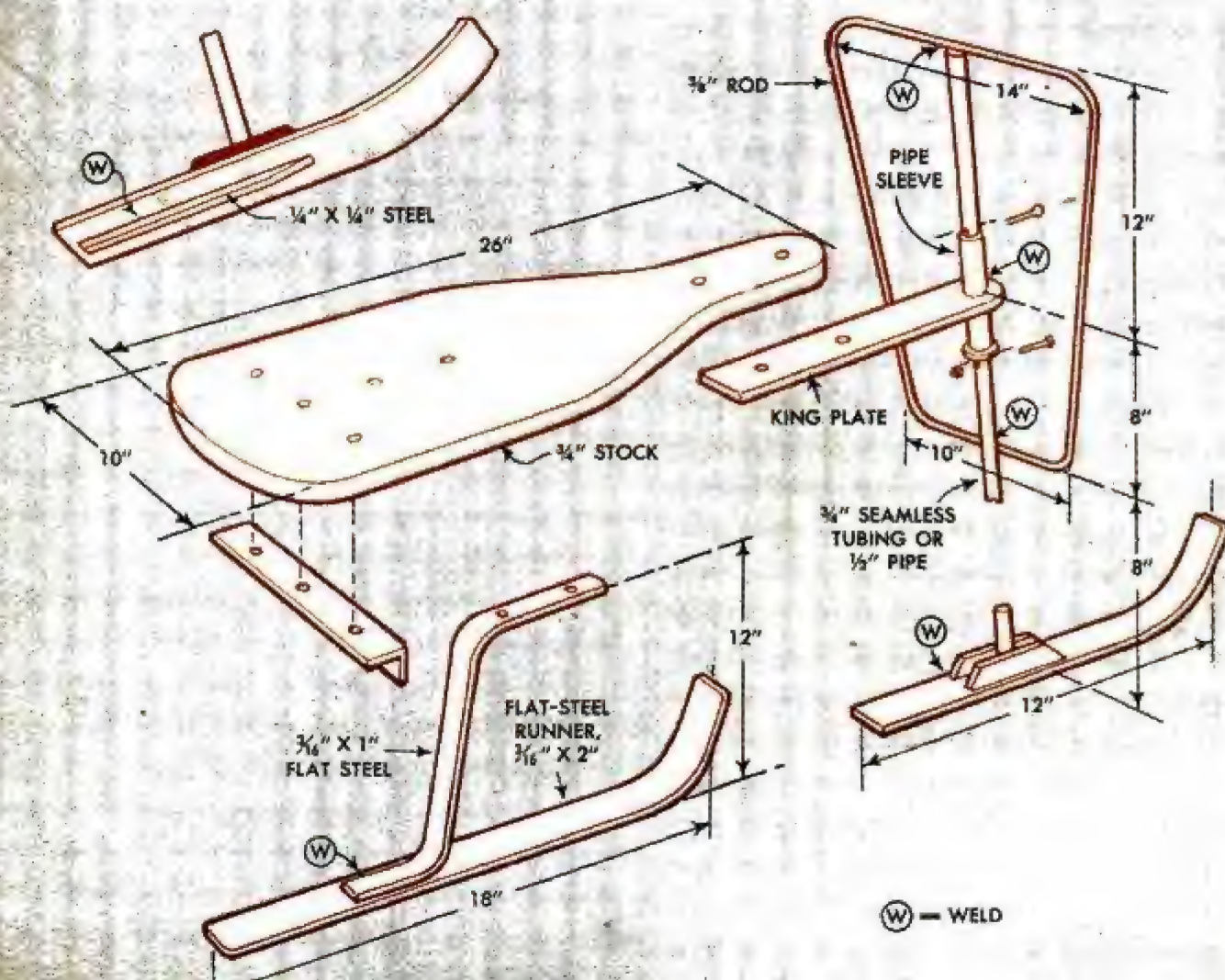
is Light and Swift

By Hi Sibley

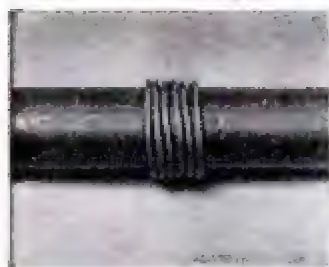


Rider balances on snow scooter much as he would on a bicycle. Feet on steering bar help to control at high speeds, and steel strip on front runner gives positive-steering action. Homemade original was a favorite among guests at California winter resort

ORIGINALLY designed and built at a California winter resort, this snow scooter proved to be a great favorite with winter-sports fans. It requires enough skill to be challenging and yet is simple enough that anyone can use it. The construction is almost entirely a matter of welding and bending. With the exception of the seat, which should be cut from clear, well-seasoned straight-grained wood, all of the material to make the scooter can be picked up in a junk yard at small cost. First, cut the steel for the runners and supports, then bend and weld as shown. Next, put together the steering post and front assembly, noting that the steering bar is bent to shape and welded after the steering post is assembled. Finally, shape the wooden seat and attach it to the front and rear runner assemblies with carriage bolts. Then paint all surfaces except bottoms of runners.



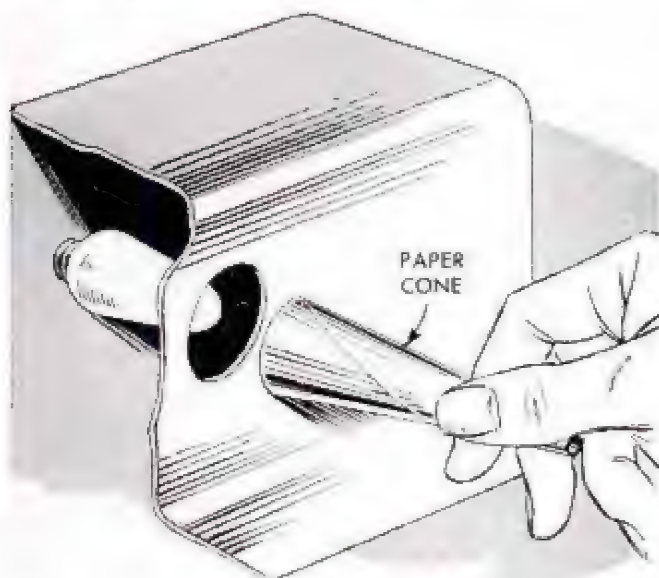
Turns of Wire Around Pipe Leak Reinforce Liquid-Solder Patch



To repair a small leak in a water pipe with liquid solder, wrap four or five turns of copper wire tightly around the pipe at the break. The wire will help the solder adhere to the pipe. For best results, the solder should be applied to the wire around the entire circumference of the pipe in a thick layer.

Eugene Lee Burner, Morgantown, W. Va.

Burned-Out Pilot Light Removed By Paper "Wrench"

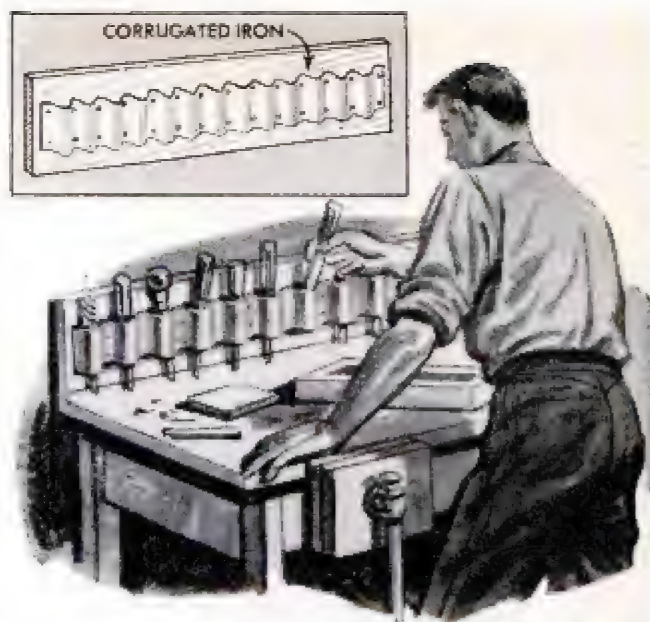


Some electric ranges are designed so there isn't finger space around the pilot light to remove a burned-out bulb. A 4-in.-square piece of heavy brown paper can be used to make a "wrench" for easy removal of such bulbs. Roll the paper into a cone that tightens when turned to the left. When placed over the bulb and twisted, this cone will grip the bulb tightly. Reverse the procedure to install a new bulb.

Cleaning Automobile Floor Mats

Care should be taken when cleaning automobile floor mats to avoid the use of naphtha, carbon tetrachloride or cleaners containing similar solvents. The mat usually consists of carpeting that is cemented to a rubber backing. If a solvent is allowed to come in contact with the cement, causing it to dissolve, the rubber and carpeting in most cases will separate. The safest method would be to use an ammonia-type cleaner or, better still, plain soap and water.

D. B. Owens, Toledo, Ohio.



Handy Tool Rack for Workbench From Corrugated-Metal Strip

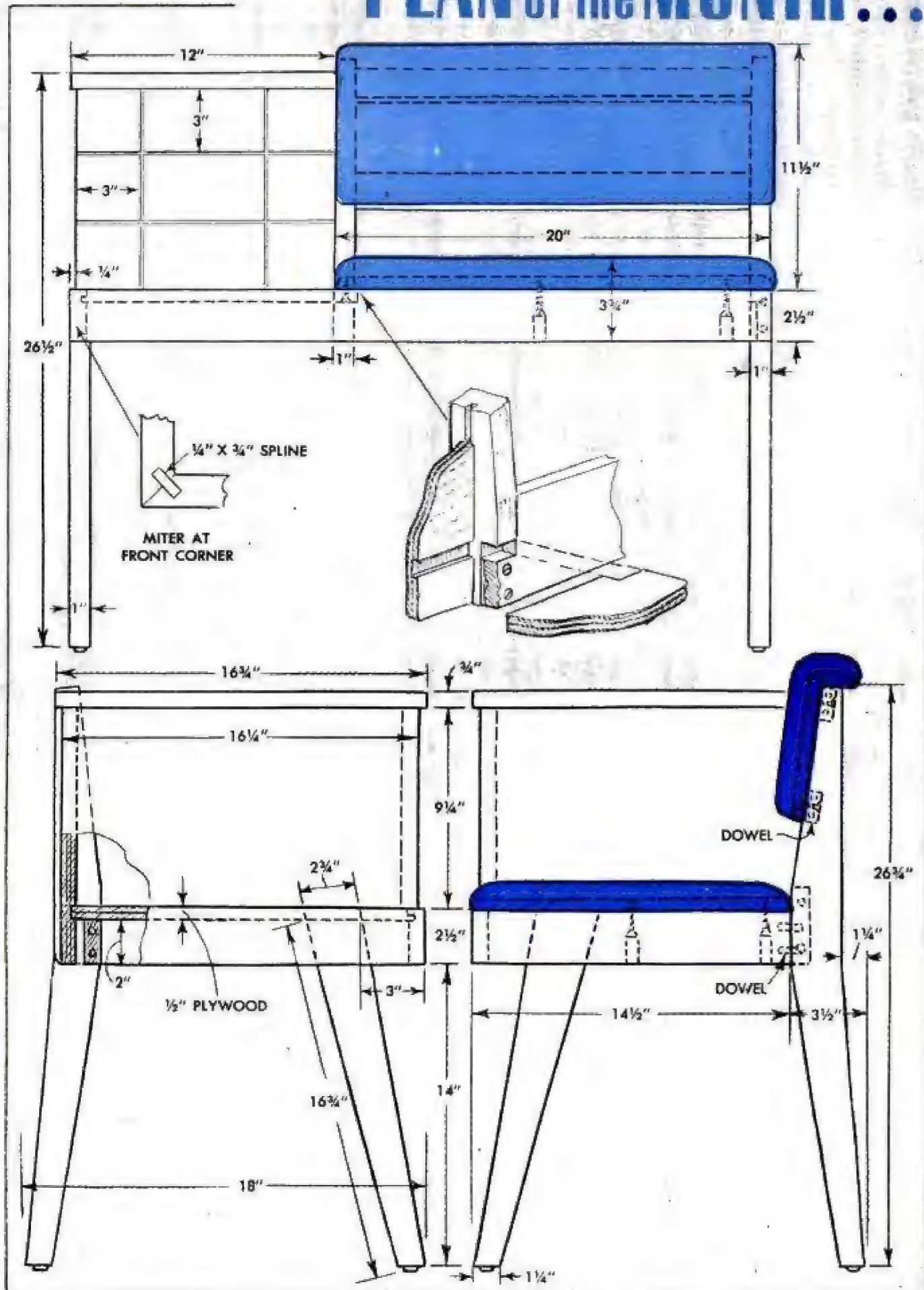
Nailed to the backboard of a workbench as shown, a strip of corrugated galvanized steel will provide a practical tool rack that can be installed in a matter of minutes. The strip, which is cut about 6 in. wide, should be attached so the bottom edge is at least 2 in. above the top of the bench. Mounted in this way, the rack can accommodate long chisels and screwdrivers easily.

Lipstick Tube Container Stores Spare Flints and Small Parts

This handy container for carrying spare cigarette-lighter flints, tiny camera parts, screws, etc., in a key case was made from a sample lipstick tube. First, the tube was cleaned thoroughly and then a small hole drilled in the end of the inside tube. Part of the threaded end of a screw eye was removed and the remainder forced into the hole and soldered in place for attaching the tube to the key case. A loop of wire may be substituted for the screw eye if more convenient.



PLAN of the MONTH...



...Gossip Bench

Once again from the drawing board of the noted furniture designer, John Bergen, comes an outstanding piece of modern furniture for the home craftsman. This gossip bench has pleasingly simple lines and, more important, equally simple details of construction. Cabinet plywood is used on the exterior surfaces, and the craftsman has a wide selection of veneers from which to choose. In the detail the seat is on the right side of the bench, but this can be reversed if necessary. All edges contacting the upholstery are rounded, and two layers of cotton are used to pad the bench

LIST OF MATERIALS

Cabinet Plywood

- 1 pc.— $\frac{3}{4}$ " x $16\frac{3}{4}$ " x 12"—Top
- 1 pc.— $\frac{3}{4}$ " x $11\frac{3}{4}$ " x $9\frac{1}{4}$ "—Front
- 1 pc.— $\frac{3}{4}$ " x $16\frac{3}{4}$ " x $9\frac{1}{4}$ "—Side
- 1 pc.— $\frac{3}{4}$ " x $11\frac{3}{4}$ " x $9\frac{1}{4}$ "—Back
- 1 pc.— $\frac{1}{2}$ " x $16\frac{3}{4}$ " x $11\frac{1}{2}$ "—Shelf

Fir Plywood

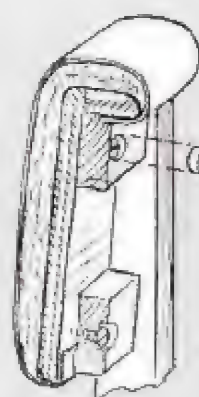
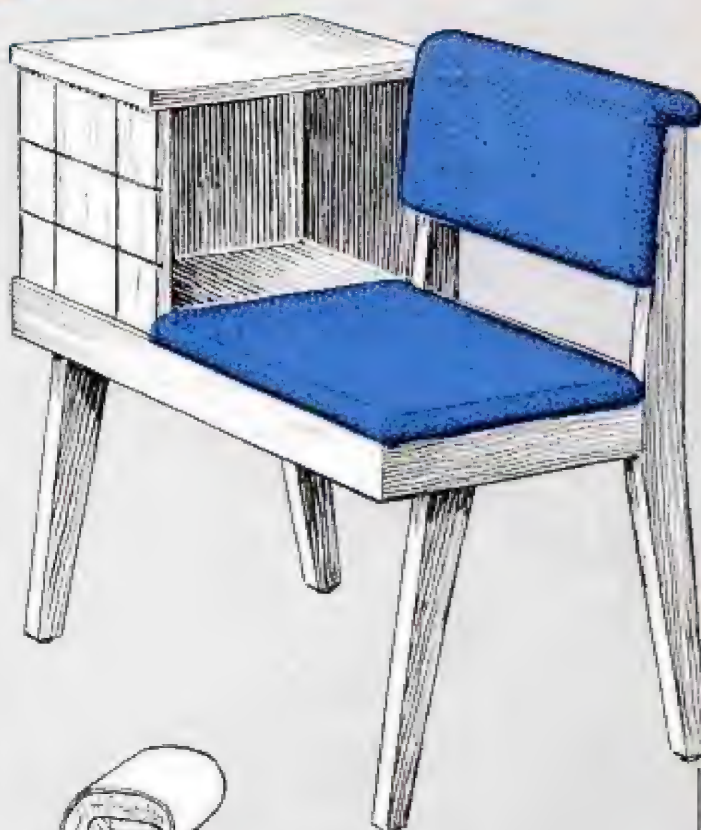
- 1 pc.— $\frac{1}{2}$ " x $14\frac{1}{2}$ " x 20"—Seat
- 1 pc.— $\frac{1}{2}$ " x 7" x 20"—Back
- 1 pc.— $\frac{1}{2}$ " x $13\frac{1}{2}$ " x 20"—Top back

Lumber

- 1 pc.— $\frac{3}{4}$ " x $2\frac{1}{2}$ " x 32"—Front rail
- 2 pcs.— $\frac{3}{4}$ " x $2\frac{1}{2}$ " x $14\frac{1}{2}$ "—Side rails
- 1 pc.— $\frac{3}{4}$ " x $3\frac{3}{4}$ " x 30"—Back rail
- 2 pcs.—1" x $2\frac{3}{4}$ " x $16\frac{3}{4}$ "—Front legs
- 1 pc.—1" x $3\frac{1}{2}$ " x $26\frac{3}{4}$ "—Back post
- 1 pc.—1" x $2\frac{1}{4}$ " x $12\frac{3}{4}$ "—Back post
- 1 pc.—1" x $3\frac{1}{2}$ " x 16"—Back leg
- 2 pcs.— $\frac{3}{4}$ " x $1\frac{1}{2}$ " x 18"—Back rails

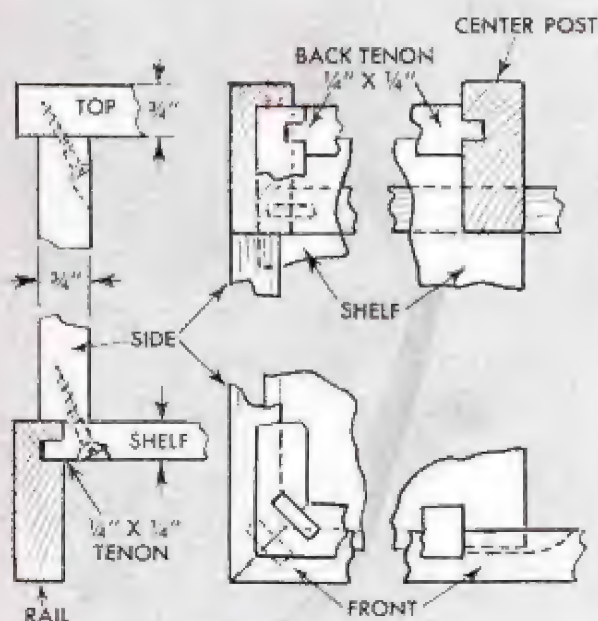
Miscellaneous

- $1\frac{1}{2}$ yd. 27" wide upholstery cotton
- $\frac{1}{2}$ yd. 54" wide upholstery cover
- 4 $\frac{5}{8}$ " dia. glides
- $1\frac{1}{4}$ " dia. dowel

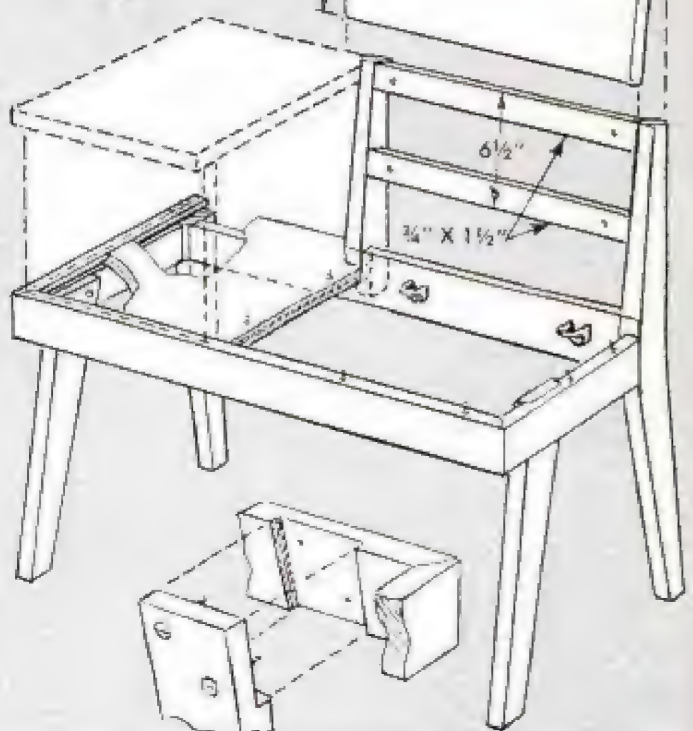


WOODEN
BUTTON

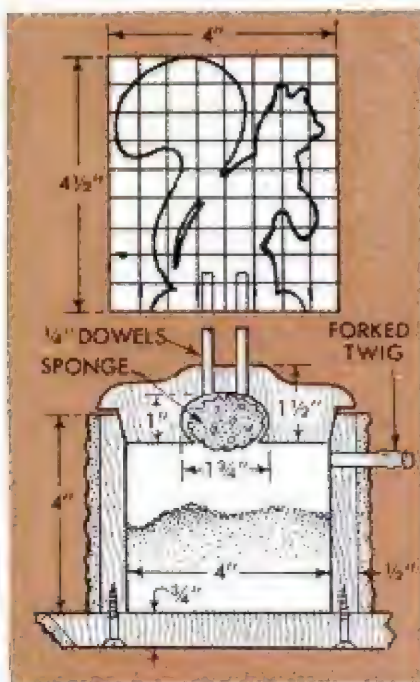
$\frac{1}{2}$ " PLYWOOD



PLAN OF TELEPHONE DESK



Rustic Smoking Set Made From Piece of Log



This attractive smoking set can be made almost entirely from a 6 1/2-in. section cut from a log approximately 5 in. in diameter. First, mount the section on the faceplate of a lathe and bore lengthwise to provide a hollow wooden cylinder having an inside diameter of 4 in. After beveling the inside of the rim at one end, turn a cover on the lathe from a piece of hardwood and bevel the underside to fit the beveled end of the log section. Next, use a gouge to form a well, centered on the underside, that is large enough to take a piece of sponge in the

Rubber Glove Rubbed on Mohair To Improve Vacuum Cleaning

Before using a vacuum cleaner on furniture having a mohair or other deep-nap covering, try rubbing all surfaces with a rough-rubber glove. Friction caused by the rubbing not only loosens matted fibers and makes them stand erect but also brings any broken fibers and lint to the surface. Rubbing should be done with circular movements, working the accumulated nap, fibers and lint into rolls so they may be picked up easily by the vacuum cleaner. For best results, adjust the vacuum for deep cleaning. Crepe-rubber soled shoes can be used to secure the same results on small throw rugs and other flat, deep-napped articles.

Virginia Musgrove, Wilder, Idaho.

manner illustrated. Then, using a scroll-saw, cut the figure of a squirrel or other small animal from a piece of 1/2-in. walnut and attach it to the top of the lid with dowel pegs and glue. To form a base for the set, as well as a bottom for the humidor, cut a thin section from the log at an angle so that a piece several inches larger in diameter than the original log is provided. Before mounting the humidor with screws near one edge of the base, gouge recesses near the opposite edge in which the pipe bowls will be placed. This done, sandpaper the section and finish with shellac. After assembling the set, drill holes in the side of the humidor to take forked twigs in which stems of the pipes will be held. To complete set, add matching ash trays.

Hi Sibley, Nuevo, Calif.

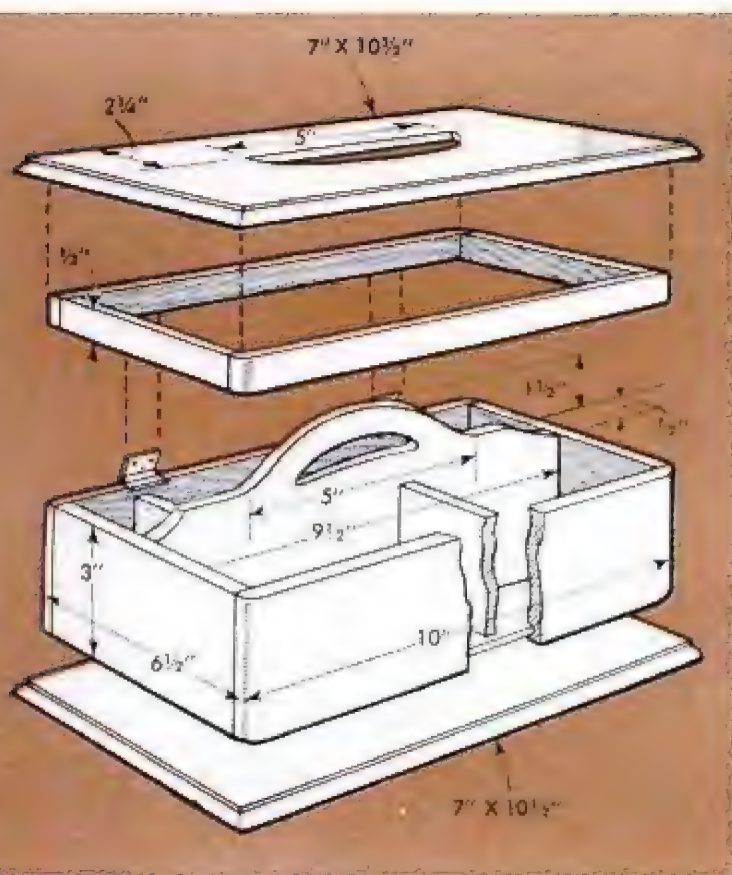
Tape Around Wire Splices Secured With Weather-Strip Cement

To assure that electrician's tape will not loosen when used on a wire splice, coat it lightly with weather-strip cement. The treatment is especially useful when repairing electrical wiring in an automobile where loosened tape might cause a "short" that could result in sudden loss of headlights or in ignition failure.

Improvised Bandsaw Tire

If your bandsaw throws a tire right in the middle of a job, wrap the wheel with electrician's tape to serve as a substitute tire until a new one can be obtained. Use three layers of tape, placing two of them side-by-side and centering the third layer over the other two, splicing the ends carefully.—Edwin M. Love, Palmdale, Calif.





PORTABLE "BEAUTY SHOP"

THIS UNIQUE VANITY case, with special compartments for bobby pins, waving solution, combs and curlers, provides the lady of the house with a portable "beauty shop." Featuring a lid that prevents spilling when the box is carried, the case is made of 1/4-in. maple throughout. Construction details are given in the illustration, except for the position of the compartments, which is determined by individual needs. If the lid is hinged, the hole to receive the handle must be cut to fit, determining its shape by trial and error. The hinges may be omitted and the lid made to fit down over the handle. — Doris Fry Wiley



Put a Brilliant Finish on Plastics With Ordinary Polishes

Plastic rods can be brought to a high brilliance on a lathe without the expense of commercial polishing compounds by using cleaning materials found around the home. Almost any speed between 700 and 1400 r.p.m. can be used. At low speed the operation takes longer and the rods show more scratches. If the speed is too high, the rods vibrate or become hot. Fold a cotton cloth into a 2 x 4-in. pad four layers thick. Dip in water and squeeze until nearly dry, then rub a pinch of tooth powder on one side. Hold the pad against the

rotating rod lightly, moving it continually until the rod takes on a smooth but unpolished surface. To bring out the luster and color, use another cloth pad and apply auto-body wax in the same fashion as the tooth powder. A hard bright polish will appear quickly. A combination auto-body cleaner and polish can be substituted for the wax. Rubbing compound or a fine, abrasive, paste-type cleaner can be used instead of tooth powder. A kitchen scouring powder will remove any scratches on the finished product.—Alfred D. Beavin, Fair Haven, Vt.

Difficult Inside Measurements Made Easy by Quick Caliper



To conveniently measure a place beyond reach, such as between rafters, a caliper can be constructed quickly from two sticks or laths. The sticks are crossed and a single nail is driven through both at the point of crossing so that they can pivot. One end of this cross is inserted in the space to be measured and adjusted to fit. A C-clamp is tightened at the pivot point to hold the arms in place. When the cross is withdrawn, the spread of the arms is measured, giving the exact inside dimension.

Nathan Darling, Orleans, Mass.

Safety Pin Holds Pen in Pocket



over the pin and held so that a considerable pull is required to release it.

Tape Applied With One Hand

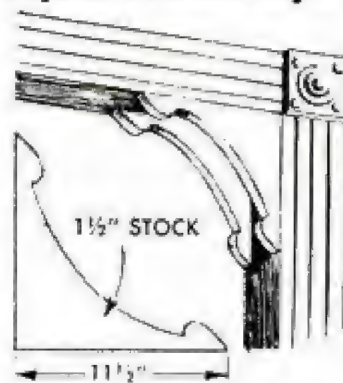
When using friction tape in close quarters, where only one hand may be used for the wrapping job, unroll the needed length of tape and reroll it tightly on itself, with the sticky side out. Rolled in this manner, the tape can be used by manipulating it between the thumb and fingers of one hand.

Harvey Muller, Bucks County, Pa.

Trim Dresses Up Square Archways

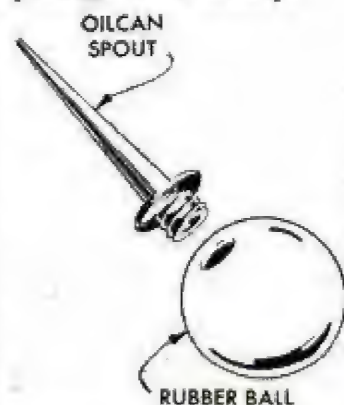
To give your square archway a "new look" without tearing out the casing, install these corner trims. A variety of patterns may be used, though the simpler ones are better. Cut four corners from 1½-in. finished pine and install in the corners with countersunk screws. Cover the screw heads and finish to match the other molding of the arch.

Joseph Shafer, Greenland, Mich.



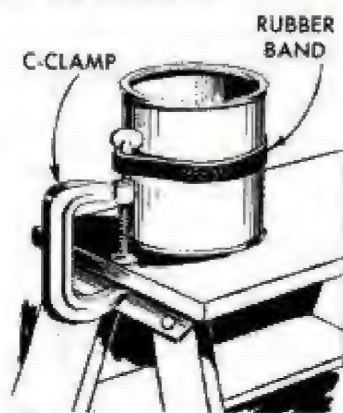
Improvised Air Syringe for Shop

An emergency workshop air syringe for cleaning newly drilled holes can be improvised from an oilcan spout and a hollow rubber ball. A hole somewhat smaller than the threaded spout end is cut in the ball. When the spout is turned into this hole it makes an airtight connection. The syringe also can be used as a powdered-graphite applicator. If the ball is half filled with graphite, a slight pressure on it will blow the lubricant into inaccessible places.



Paint Can Secured to Ladder

To insure against spilling a can of paint when working from a step-ladder, attach a C-clamp to the top of the ladder and snap a wide rubber band around the clamp and the paint can. When repairing windows or doing any job which requires frequent moving of the ladder, this same rig is helpful if an empty can is used to hold the putty, Spackle, or other material being used.



¶ If for any reason you are unable to locate or purchase ink for immediate use, use liquid bluing which usually can be found included in home-laundry supplies.



TELEVISION HAS SOCKS

WHEN YOUR TV friends drop in and are offered one of these comfortable plastic-covered hassocks, they'll never know that they actually are sitting on cheeseboxes stacked on top of one another. But that's what Doris E. Beardsley of Yoakum, Tex., used to simplify and cut the cost of these smart hassocks to practically nothing. Most any neighborhood grocer will gladly let you have the empty circular wooden containers in which bulk cheese is packaged. These boxes measure approximately $5\frac{1}{2}$ in. high and $14\frac{3}{4}$ in. in diameter. Two boxes make a hassock about 12 in. high when padded; three boxes make one that is chair height, or 17 in. First, the lid is nailed to the bottom box by driving short nails through the lower edge of the rim. The second box, with lid removed, is placed on top of the first box and then nailed to it through the bottom. Then the lid is nailed on as before and the step is repeated in adding each box. In upholstering a hassock, the cheesebox framework is first covered completely with cotton padding which is tacked here and there to hold it in place. Then a burlap covering in the form of a sack is pulled on over the cotton padding and tacked to the bottom of the hassock. The final covering is made in the form of a sleeve with a circular piece sewed in one end and a welt cording stitched in the seam. The welt is made by covering a length of cord with a $1\frac{3}{4}$ -in. strip of the finish fabric as shown in the lower right-hand photo. If desired, two welt seams can be used, one being placed about 5 in. down from the top as shown in the lower left-hand photo.

A



B



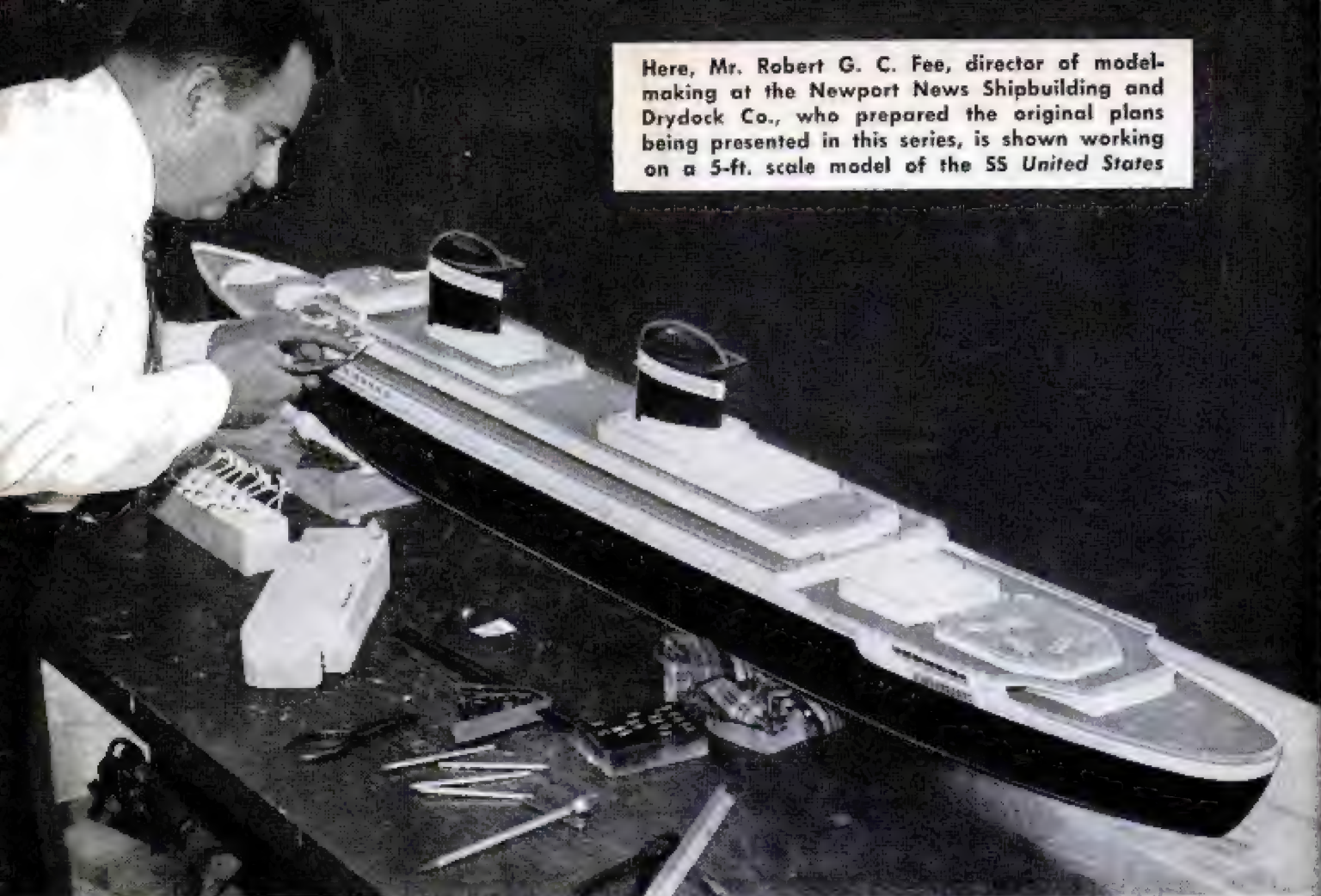
C



D



Here, Mr. Robert G. C. Fee, director of model-making at the Newport News Shipbuilding and Drydock Co., who prepared the original plans being presented in this series, is shown working on a 5-ft. scale model of the SS *United States*



36-in. Model of the Part III **SS UNITED STATES**

WHILE it was mentioned in Part II that the portholes are added before the hull is painted black, you may prefer to leave the ports in their natural brass finish. In this case, the hull is painted first. Also, instead of indicating the loading ports by fine white lines, it may be easier for you to do a neater job by cutting the ports from thin cardboard and then gluing them to the hull before it is painted. The slight relief is enough to make them stand out nicely, but not too prominently.

Our next step in building the SS *United States* is to fit the wooden promenade deck. After this is sanded smooth, a $\frac{1}{16}$ x $\frac{1}{4}$ -in. groove is made in the center of both edges to house a strip of clear plastic which represents windows. As the sheer line between stations C and G assumes a slight curve, the promenade deck likewise follows the same curve. This means that, while the deck piece can be bowed to match the sheer line by simply drawing it down with two flat-headed wood screws and glue, the plastic strip cannot be bent edgewise and consequently must be cut on a curve matching that of the groove. The windows

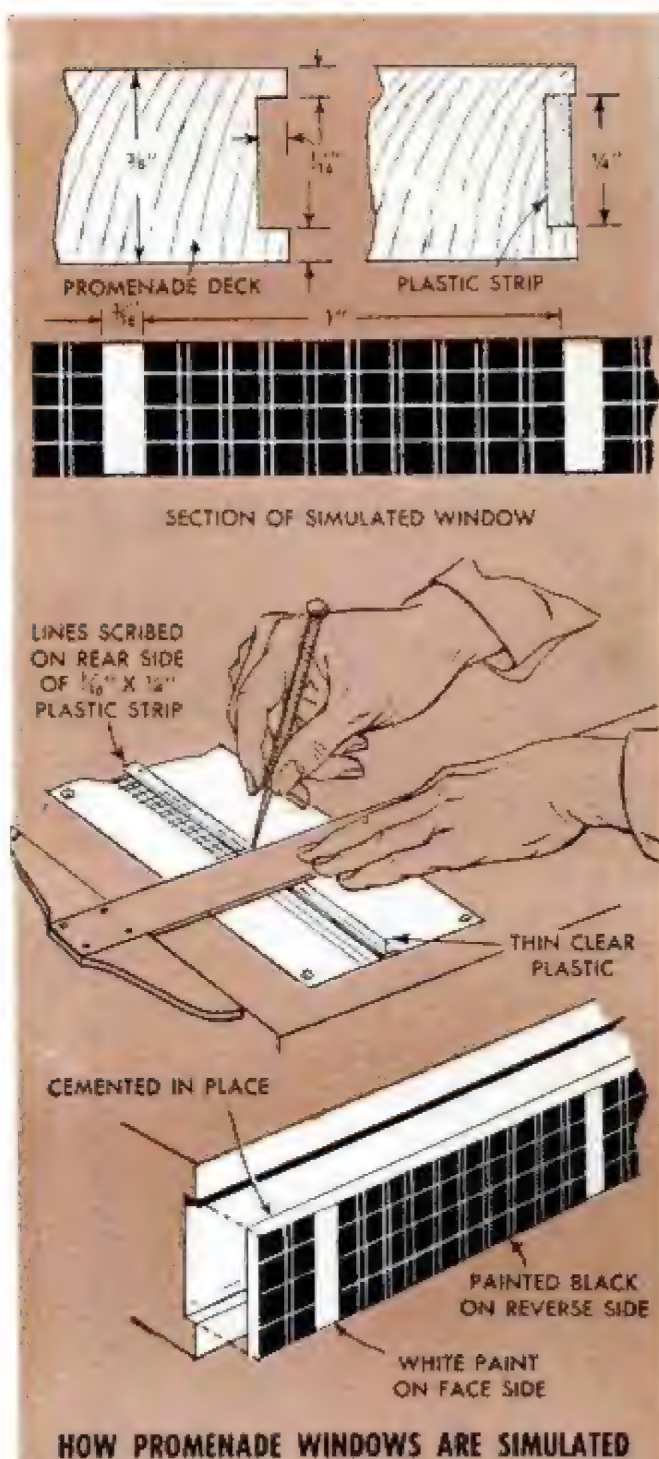
are simulated by scratching lines on the rear side of the plastic strip, wiping the lines with white paint and then painting the back of the strip black. Each window section measures 1 in. long and is separated with $\frac{3}{16}$ -in. "pillars" which are represented with white paint. The best way to scratch the lines uniformly is to first rule the line on paper. Then, by tacking the clear plastic strip in position over the lines on the paper you can use them as a guide in scoring the plastic. Any sharply pointed tool will do to scratch the lines. As you'll see in studying the section of simulated window shown on the opposite page, three lines are made horizontally and double lines are scratched vertically to represent individual panes. Small pieces of masking tape placed along the edges of the pillar divisions, on the face side of the plastic, permit a neat job of painting. Note that the plastic strip, when cemented in the groove, is recessed slightly from the edges of the promenade lift.

Next, the upper deck lift is added. As it supports the brass promenade deck, it will be more convenient to paint the edges

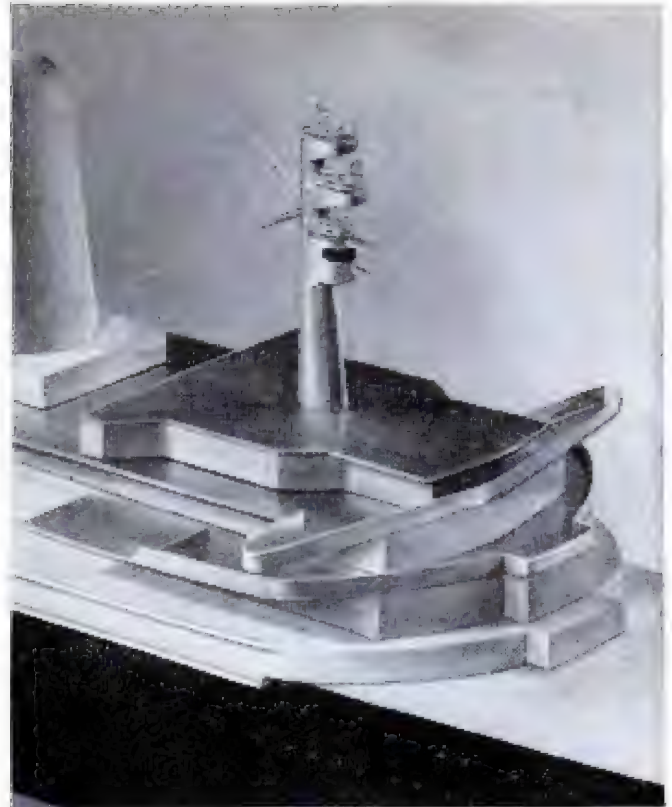
of this lift, as well as the top surface of the hull, before the brass deck is screwed to the upper deck. The brass deck, being the same width as the wooden promenade deck, also overhangs the hull and is supported at the outer edges with two brass enclosure strips. The pattern for these is given full size on page 216, ready for tracing. After cutting and carefully filing each one to shape, they are fitted flush in tiny rabbets formed along the sheer and held in place with household cement. The brass promenade deck merely rests on the top edges of the enclosure strips and does not require soldering. The pattern for pieces A is likewise given actual size and, like the enclosure strips, these parts are shaped from brass for easy soldering. Two of these are needed and are soldered to the outer edges of the metal promenade deck at the aft end of the wooden promenade deck. The tiny railing, which is later applied around the edge of the metal deck, terminates at pieces A.

The wooden sun deck may be added next. Note that the fore end of this piece is first recessed approximately $\frac{1}{32}$ in. deep to receive, flush, the metal sports deck. It is well to prefinish the edges of this lift and to fit the 64 portholes that are installed in the edges along each side. The same eyelets are used here as in the hull. The proper spacing of the ports is determined by referring back to Part I and the profile view. The sun deck is attached with glue and screws, the screws being placed so as to be hidden by the two sports decks which top the sun deck.

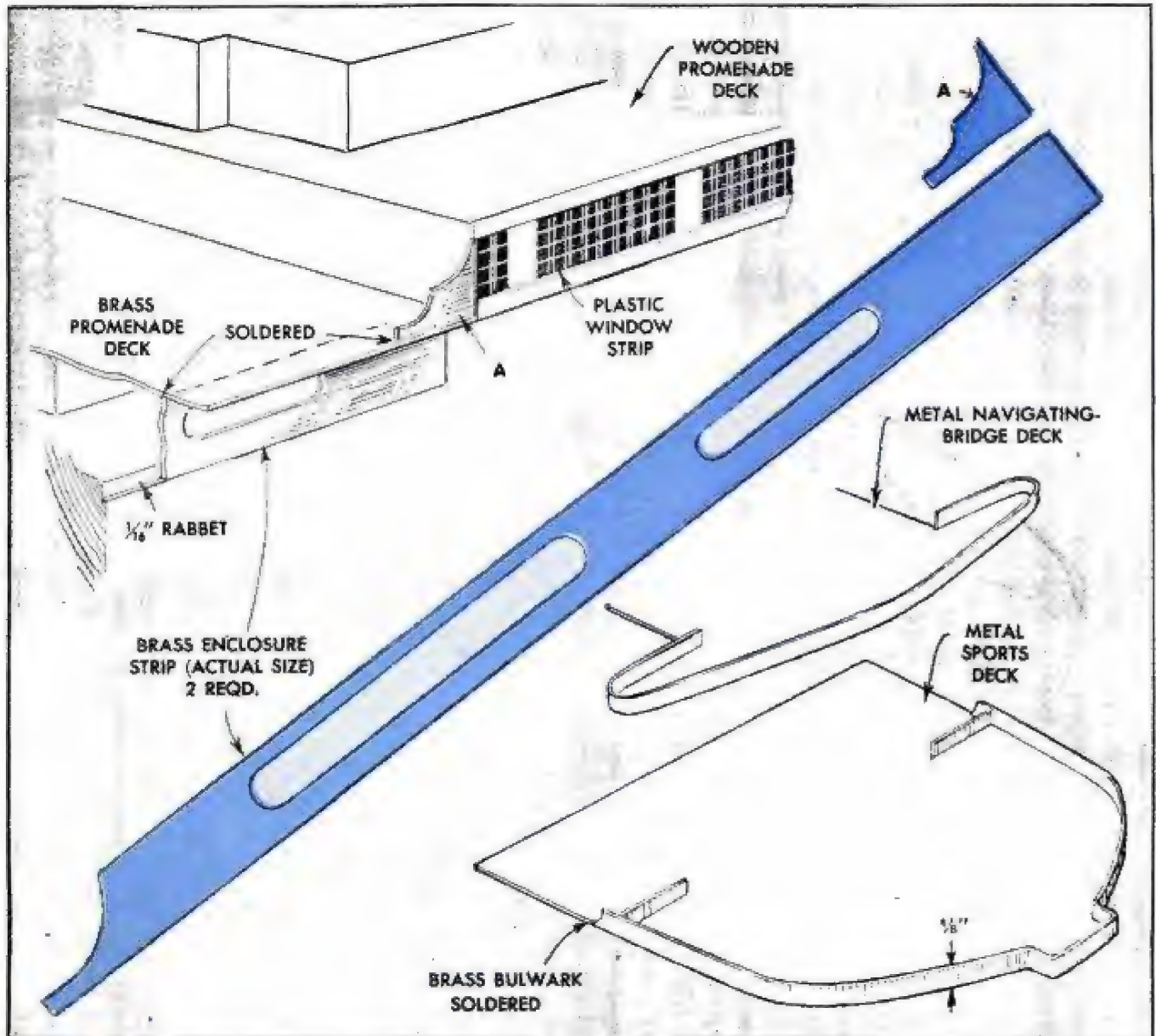
A total of 24 lifeboats is required, two being slightly smaller than the others. The lifeboats on the actual ship are 40 ft. long and will accommodate 140 persons. Differing from the usual lifeboat which is fitted with oars, the boats on the SS *United States*

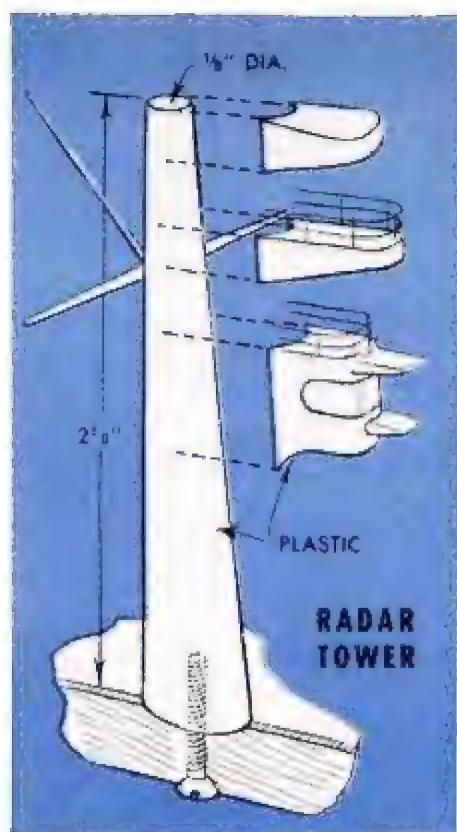


This partially assembled view shows where the construction of our keel model has progressed to date. In order to be sure that every detail is worked out completely for the reader, *Popular Mechanics* is building this model and presenting the tested construction methods employed by the modelmaker



Comparing actual ship with the model, these two views of radar tower show the detail carried out in the model





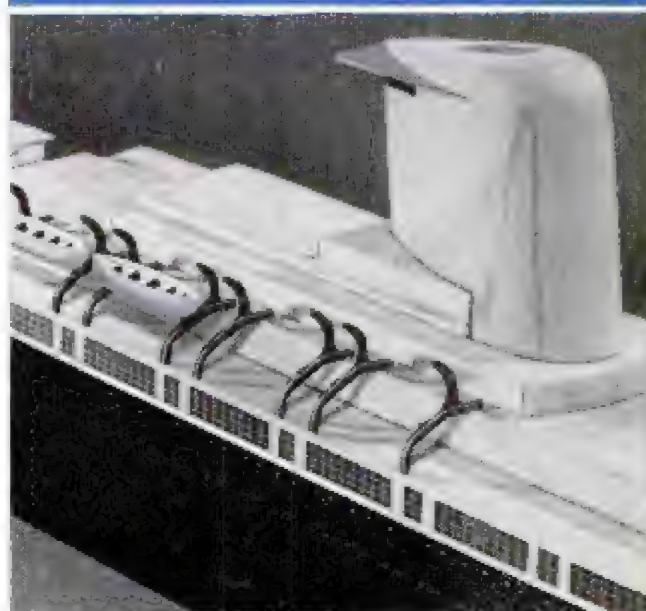
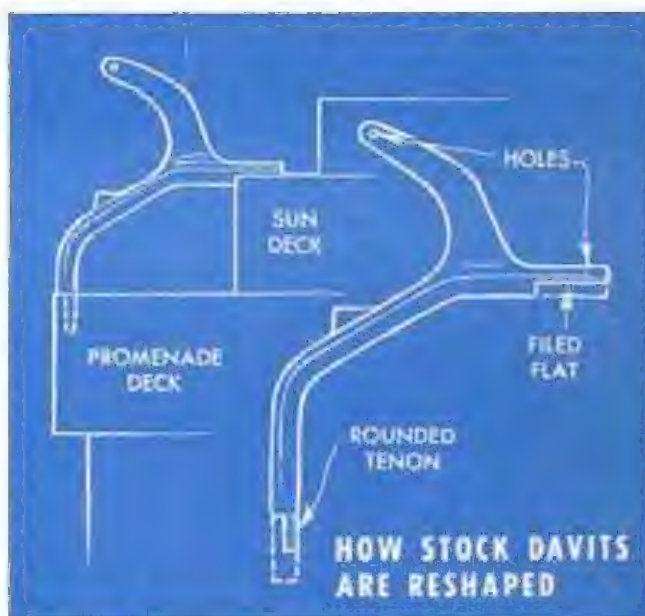
Lifeboats 40 ft. long skirt the promenade deck on actual ship and are represented by 1 1/4-in. boats on model

are equipped with five pairs of push-pull handles. These handles are pumped back and forth in unison to spin a propeller. On the model, the lifeboats are a mere 1 1/4 in. long, and while these may be hand-carved individually, they can be purchased in a kit along with the davits, portholes, propellers, anchors, winches, capstan, bitts, roller chocks and other fittings. The lifeboat davits are located according to the plan view and installed in a row of tiny holes made along the edges of the promenade deck. The upper ends of the davits are pinned to the sun deck. Each cast lifeboat has tiny hooks with which it is hung from the davits with fine wire.

The metal sports deck, which fits in the recessed end of the wooden sports deck, is fitted with a 1/8-in.-high bulwark as shown in the drawing at the left. This is soldered to the surface of the metal deck, even with the outer edge. The same is done in the case of the metal navigating-bridge deck. Stacked in order, the various lifts should look like the right-hand photo at the top of the opposite page. Fencing is still to be added to the metal decks.

The radar mast is modeled in clear plastic, the tiny parts being cemented together, and then painted aluminum. The small window is simulated by placing a bit of masking tape over the plastic before the mast is painted. Wire railings are cemented to the edge of each platform and a machine screw is turned in a tapped hole in the end of the mast to anchor it to the deck.

(Continued next month)



Sander for Model Builders From Electric-Fan Unit



To speed the sanding of small work, one model builder removed the guard and fan blades from an electric fan and replaced them with a small sanding disk. After cutting a disk 2 in. in dia. from $\frac{1}{2}$ -in. stock, a blind hole slightly smaller than the motor shaft was drilled in one face. Then a piece of fine-grade sandpaper was applied to the opposite side and trimmed to the same diameter, after which the disk was forced on the shaft. For convenience, several disks on which different grades of sandpaper have been mounted may be kept in readiness.

Benedict Gulassa, Collegeville, Ind.

Hole "Drilled" in Glass With Molten Lead

Requiring several holes in a thin piece of glass, I formed dikes of sand around the spots to be "drilled" into which I poured a little molten lead. Starting with a small pile of sand moistened just enough to hold the particles together, I pushed a dowel into the sand as far as it would go and then moved it in a circular movement to bevel the sides, forming a cone. Next, I smeared

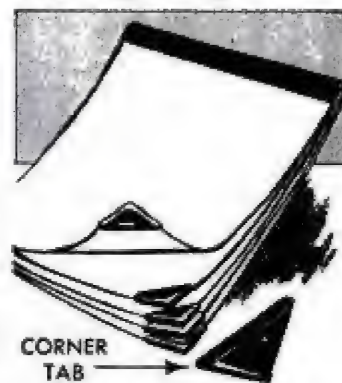
the end of the dowel with a little putty and touched it to the bottom of the hole to pick up any particles of sand that remained. Following this, I heated a small quantity of lead and carefully poured it into the dike. This caused the glass directly beneath the exposed surface to break and fall through along with the lead.

Alan E. van de Sandt, Mill Valley, Calif.

Staples Prevent Sticking Pages

Students and research workers who use bound folios of typed pages can avoid the annoyance of having the pages stick together by putting a staple in the lower right-hand corner of every other page.

If you want to dress up the appearance of the manuscript, cut the corners from envelopes and staple one to the lower right-hand corner of each page.



Photoflood Reflector Doubles As Pin-Up Lamp

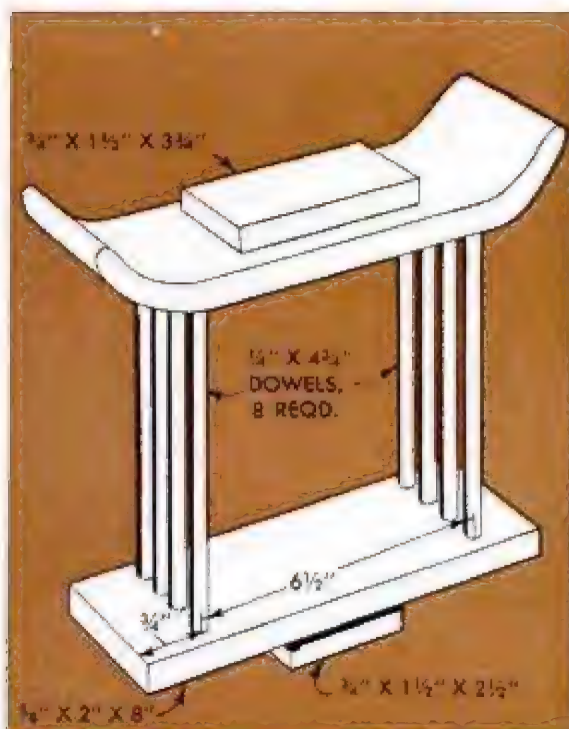
By providing a convenient clamping surface, an excellent lamp for reading, drawing or benchwork can be adapted from a clamp-on photoflood reflector. The lamp is clamped to a 2-ft. length of pipe or dowel approximately $\frac{3}{4}$ in. in diameter that is screwed to the wall in a vertical position just above the bench or drawing table as shown. A positive grip is assured by setting the pipe out from the wall with several washers.



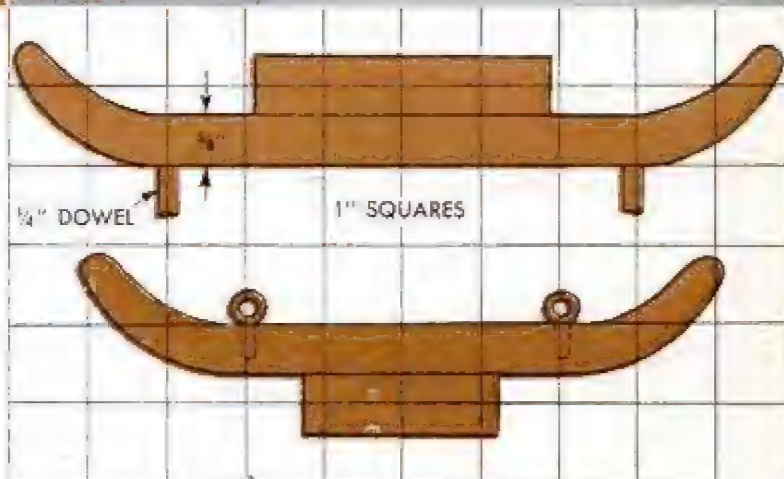
Wheel Chair Drive Unit

Members of service clubs and veterans' organizations who really do things to brighten the lives of the handicapped in their communities will want to read the story next month on motorizing a wheel chair. Designed with independence of the user in mind, the unit features push-button control, electric brakes and steering and choice of speeds

Pagoda Shelves Set Motif for Figurines



THIS TINY PAGODA shelf ensemble catches the mood of the popular Chinese carved rosewood and ceramic figurines and provides a setting to enhance their beauty. Made of pine and dowels, the set is a one-evening project. Shelf pieces are cut from pine to the dimensions shown in the diagram. Sides of the center shelf are $\frac{1}{4}$ -in. dowels, set in holes drilled to receive them, and the shelf opening is $4\frac{3}{4}$ in. high. To finish the ensemble, sand thoroughly and apply two coats of lacquer, either black or black trimmed in Chinese red. Trim with gold tassels if a further touch of ornamentation is desired.—Don Brooks, Lombard, Ill.



Adhesive Tape Over Saw Teeth Safeguards Wall Surface

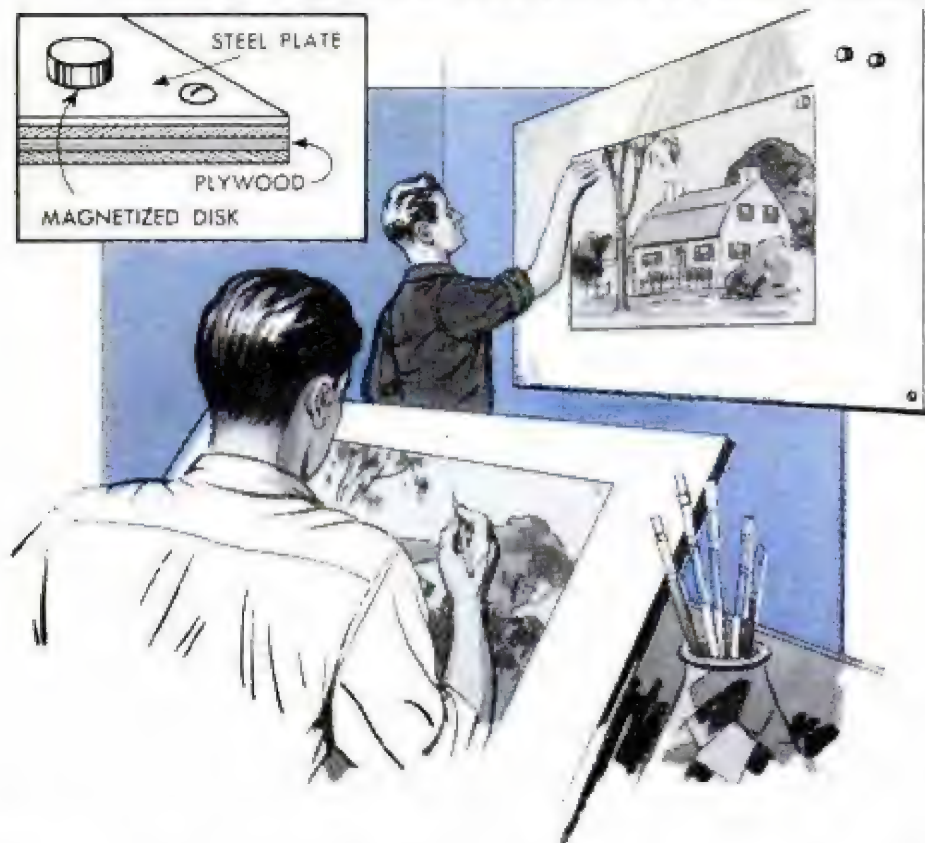
If you are ever confronted with the problem of sawing through wallboard battens and similar surface moldings without damaging the wall, fit your handsaw with adhesive-tape "teeth guards." Simply cover the teeth of the saw with two strips of tape, leaving a section exposed in the center slightly greater than the width of the batten. Short strokes are used to cut through the batten and as the rest of the teeth are covered, there's no chance of scoring the wall surface. The thickness of the tape actually will prevent sawing completely through the batten, but a few careful, short strokes with the saw-blade tip will cut through the remaining thickness.

Day Legere, South Portland, Me.

☛ If the glued-in stub of a broken chair rung won't budge, apply a little vinegar to the joint to loosen for removal.



Magnets "Tack" Notices to Bulletin Board Made of Plywood Covered With Sheet Steel



Requiring a convenient means of holding pencil sketches and other items where he could see them, one artist developed this magnetic bulletin board. The backing is $\frac{1}{2}$ -in. plywood and the face is a sheet of light-gauge steel. Small magnets, to which wooden knobs can be glued to permit easy handling, act as "tacks." The sketch is placed against the board and the magnets put over the paper at the four corners to hold it in place. This type of panel also is practical as a bulletin board for industrial plants, institutions and schools because notices will not fall off and can be changed easily. A smaller version can be used at home in the kitchen or workshop as a reminder board. — Donald Irving, Mt. Vernon, N. Y.

Gutter Cleaning in Winter Weather Simplified by Using Ice and Rope

Cleaning gutters when they are dry is a dusty and dirty job that can be handled better in the winter after freezing weather has set in. Plug the downspout opening and pour water into the gutter, placing in it every 5 ft. the ends of short lengths of rope to act as handles. After the water has

frozen, apply a heat lamp or blowtorch to the underside of the gutter until the ice is loosened. Be careful with the torch if the gutter is painted. Pull on the rope handles to lift the ice from the gutter. With it will come the dirt and leaves that have accumulated.—Ed Packer, Chicago.

Hammer Claws Provide Handy Scale for Determining Drill Sizes

A simple scale for determining the proper sizes of drills to use when drilling pilot holes for screws can be provided by scoring a hammer claw with marks representing various sizes of screws being used. This is done by separately fitting each screw between the claws as far as it will go and marking the position on the inner edge of the claw with a scribe. The mark should be centered on the screw. Then the proper drill size for each screw is either punched opposite its respective mark on the other claw or copied in black ink on the handle as desired. This gauge can also be made in a long V-notch cut in a flat sheet of metal.

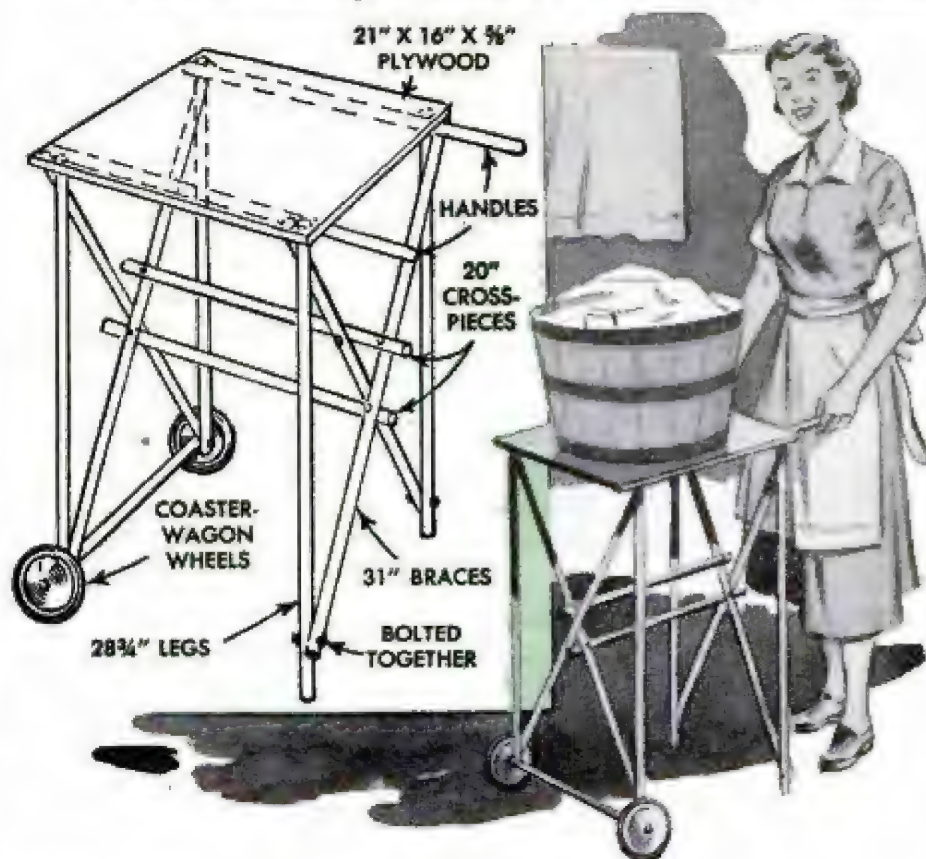


Bar-Clamping Wide Work

If work is too wide for a single bar clamp, set another clamp to the approximate length required and hook its movable jaw over the movable jaw of the other. Then tighten one of the clamps to the exact tension desired.—Jackson Hand, Palatine, Ill.

Not only ideal for use as a teacart or worktable indoors, this two-wheel cart also will come in handy when hanging wet laundry or gathering lawn and garden rakings. The top may be cut to the dimensions desired from $\frac{5}{8}$ -in. plywood, or an old drawing board may be used if available. The frame is assembled from lengths of broomstick or dowels held together by $\frac{3}{16}$ -in. stove bolts. Cross members at the top of the frame extend from one end to provide handles, while another, extending slightly from the sides of the frame serves as an axle. This is turned down at the ends to receive 6-in. toy-wagon wheels or wooden disks, which are held securely in place with washers and cotter pins.

Two-Wheel Cart Made From Scrap Materials Serves Multiple Uses in Home and Garden

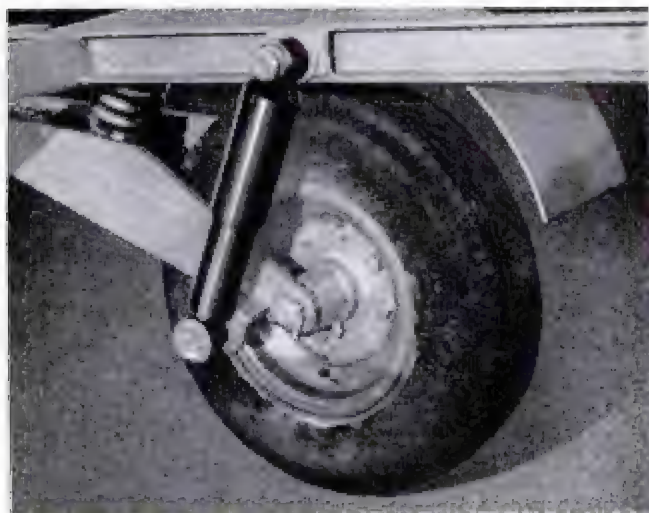


Mystifying Tricks With Color for Your Next Party

Here are two foolproof tricks with which to amuse the children or friends at your next party. Partly fill a small jar with water and add 1 or 2 drops of alcoholic phenolphthalein solution. Then add a pinch of household borax and the liquid will turn a brilliant pink. Show the audience the pink solution, put a straw in it, and blow. Presto! The pink color disappears. The secret is that the carbon dioxide from your breath sets up a chemical reaction. The second trick requires three small jars. The first contains water to which 1 or 2 drops of phenolphthalein have been added.

The second is empty, but has been rinsed with a strong solution of borax. The third has been rinsed with lemon juice. Before the second and third jars are dry, pour some of the liquid from the first into them. The audience will see the colorless liquid poured into one empty jar turn pink for no apparent reason while the same liquid remains colorless when poured into the other empty jar. It's very mystifying unless you know the secret, which is that phenolphthalein remains colorless in the presence of acids and turns pink in the presence of an alkali.—Helen Lemberger, Chicago.

Shock Absorbers Eliminate Bounce of Small Wheel on Trailer

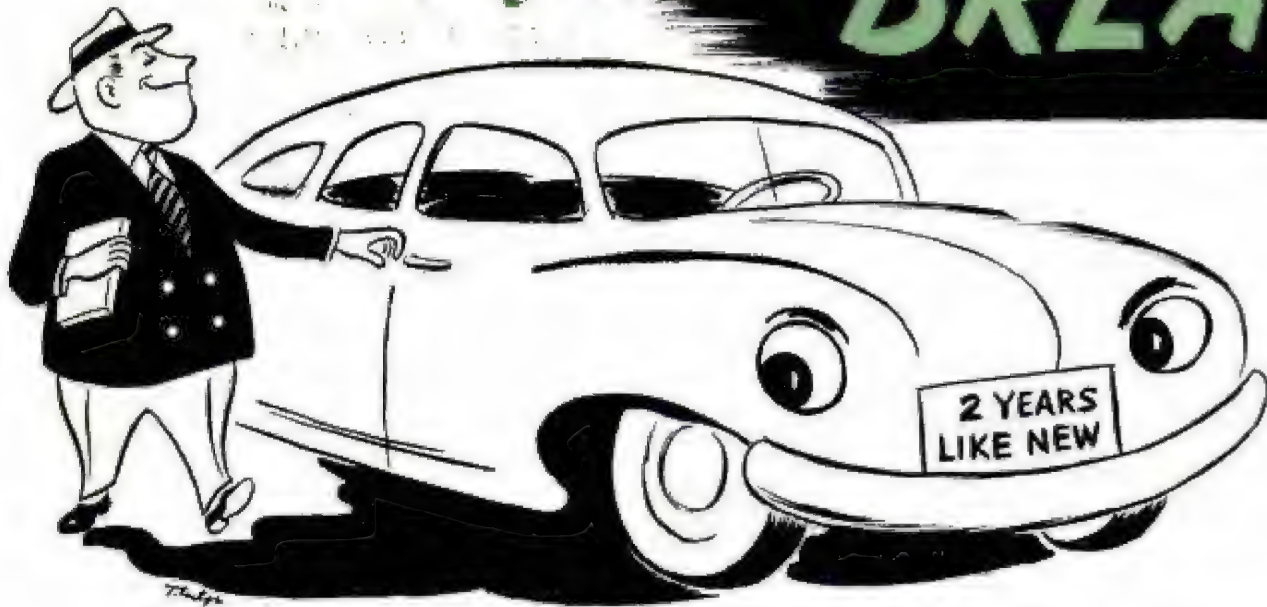


If a trailer of the type having the body mounted over one small wheel has excessive play or bounce in the wheel assembly, install a pair of light-duty, direct-action shock absorbers on both sides of the wheel. The hydraulic action not only will eliminate the trouble almost completely when the trailer is loaded but also will reduce it considerably when not loaded.

Clinton R. Hull, Costa Mesa, Calif.

☛ To prevent warping, sagging or sticking of interior doors, use three hinges instead of two when hanging. The third hinge will align the door, balance its weight and prolong its life.

BREAK



ENGINEERING PROGRESS has made your new car tops in mechanical efficiency, comfort and dependability, but whether or not it gives the best possible service is influenced directly by how you break it in. The necessity for breaking-in a new car is no reflection on its quality. All cars need careful handling when new, and the finest deserve the best. Most drivers realize the importance of limiting top speed for the first few hundred miles and the need for correct lubrication, but both of these can be overdone. A car can be "killed by kindness."

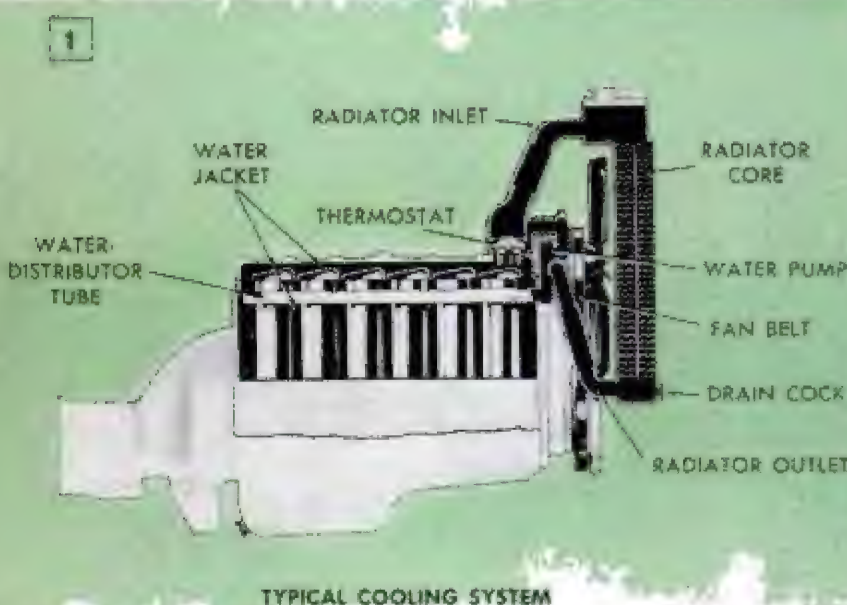
Driving too slowly, thus failing to get the new engine fully warmed up, may do permanent damage. And, while complete lubrication is necessary, overlubrication may delay the actual breaking-in and result in damage due to excessive carbon or soot accumulation. Efficient functioning of the cooling system, Fig. 1, is especially impor-

tant at this time, as the temperature gauge is relied upon to indicate engine operation.

Clearances in hundreds of moving parts in the engine, transmission and rear axle are held to tolerances equal to only a small fraction of the diameter of a human hair. The fit of a piston pin, Fig. 2, is just one of many examples of these close tolerances. Thus, the operating parts must be lubricated with an oil that is thin enough to get on the job and yet of sufficient body to provide the necessary protection against metal-to-metal contact. The oil not only must provide lubrication, but it also must help carry away heat and keep the parts clean. For this reason, attention to break-in oil is probably the one most important consideration in a new car. If your car is carrying a special type of break-in oil, be sure that this oil is discarded at 300 or 500 mi., as recommended, and that the oil is changed while the engine is hot.

While workmen at automobile factories are extremely careful in cleaning up all engine castings so that there will be no core sand or metal chips left in them, it is wise to discard the original oil at low mileage even though it may appear to be in perfect condition. Many car owners install magnetic drain plugs in the crankcase, transmission and rear axle as an added safeguard. As shown in Fig. 4, these plugs remove from circulation even the most minute iron or steel particles that might get into the lubricant.

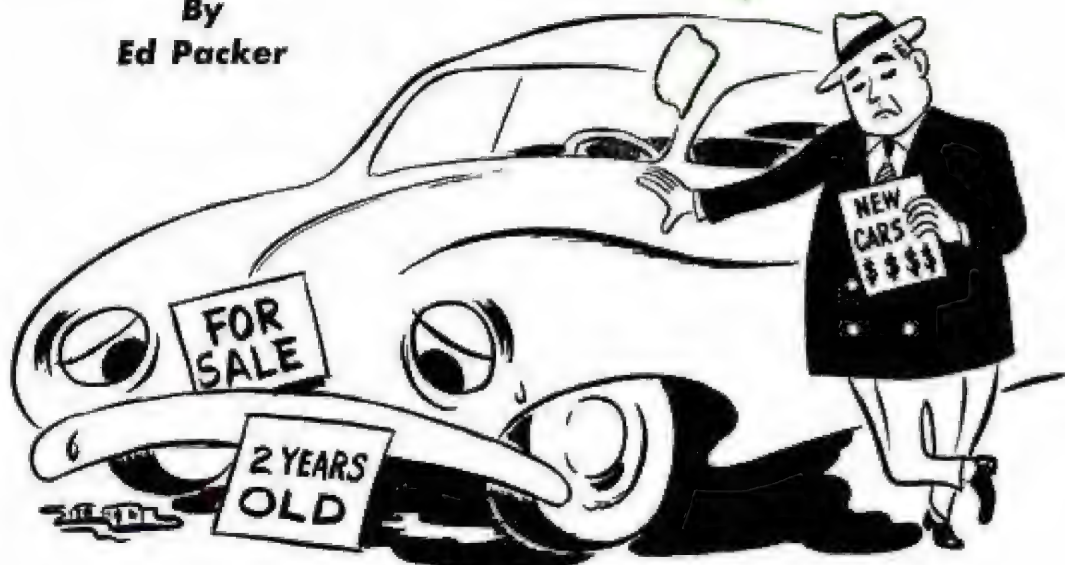
Engine oil flows from the main bearings through drilled passages in the crankshaft to lubricate the connecting-rod



'EM IN RIGHT

You've a right to be proud of your new car, but whether you'll still be proud of it a year or two from now depends almost entirely on how it is handled during the break-in period. Proper break-in is rewarded by dependable service and lower upkeep of the car

By
Ed Packer

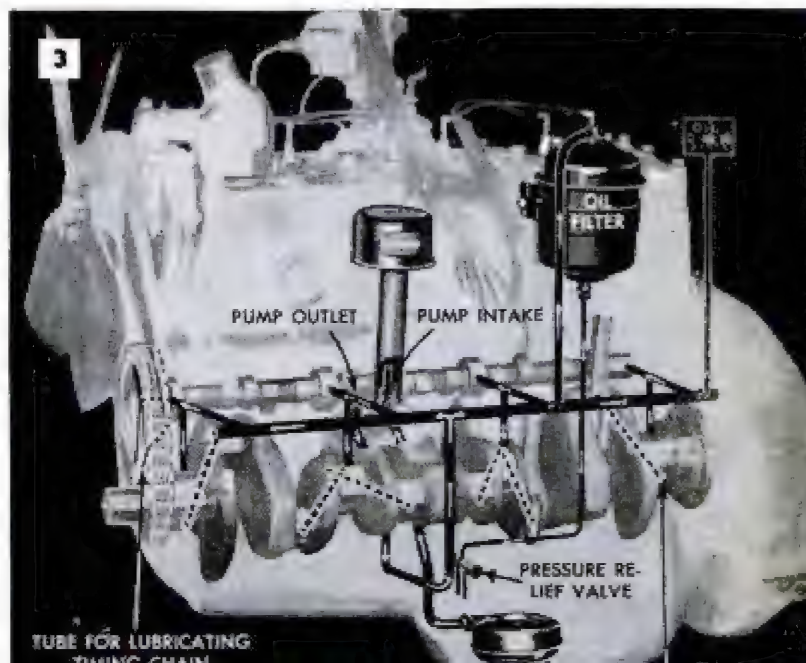


bearings, Fig. 3. In some engines, the oil then travels through passages in the connecting rods to lubricate the piston pin, piston and cylinder walls. Many engines, however, depend upon the oil thrown from the crankshaft and the rod bearings to lubricate the pistons, pins and rings with an oil spray, Fig. 4. This spray is carried over into the valve chamber or into the tappets of overhead-valve engines.

Because of these factors, driving an engine too slowly or idling it at too low speed may result in insufficient throw of oil from the crankshaft and deprive the pistons and other parts of the necessary oil spray. The amount of oil thrown by the rod bearings is influenced by the viscosity of the oil, which in turn is influenced by temperature, by

the speed of rotation of the shaft, and by the fit of the bearings. As an engine limbers up and its bearing clearances increase slightly, these bearings pass more oil to the pistons, pins, rings and other parts. Only then is it safe to maintain high road speeds. In addition to lubricating, the oil seals against blow-by of combustion gases and keeps the parts clean.

Ordinarily, makers of the finest cars warn that for the first 100 mi. (some for 500 mi.) the speed should not exceed 40 or 50 m.p.h. On the other hand, they warn against long, slow idling and driving at speeds below 25 m.p.h. Many engineers approve varying of the break-in speed. That is, if the top allowable speed is 50 m.p.h., the speed should be increased to 60 m.p.h. for a mile or so and



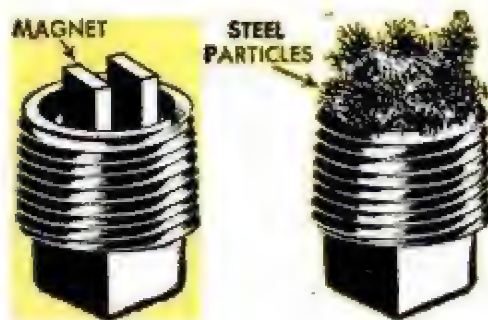
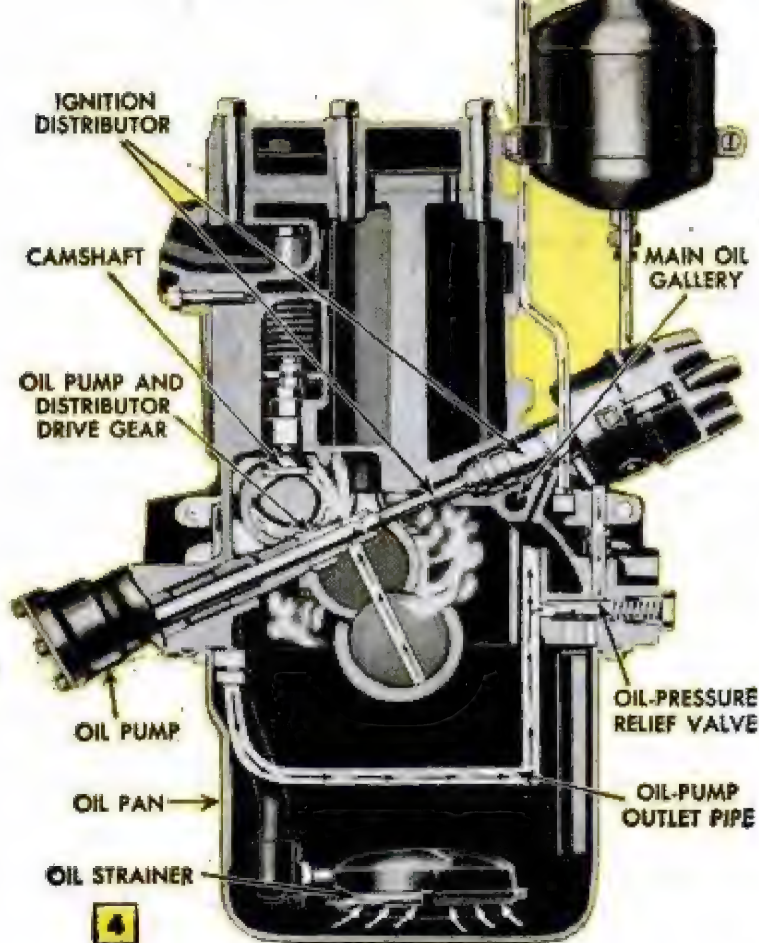


Fig. 4, above, shows a splash-type lubrication system in which the oil is thrown from the crankshaft and rod bearings to lubricate pistons. In Fig. 6, below, those points of the engine which should be checked if a car is slow starting or rough running

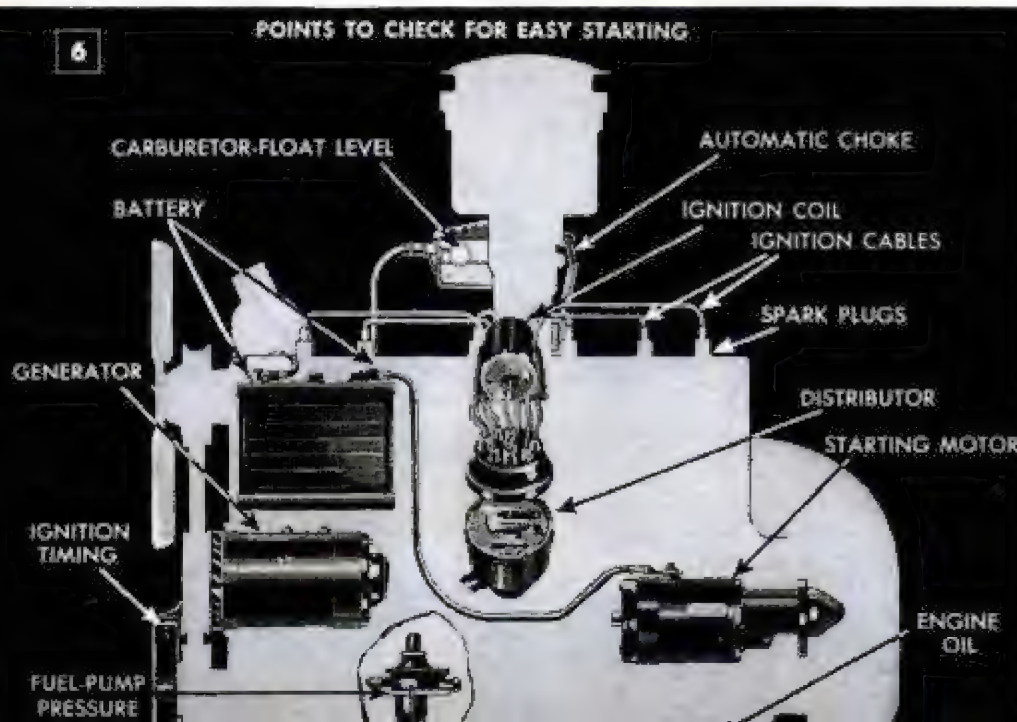


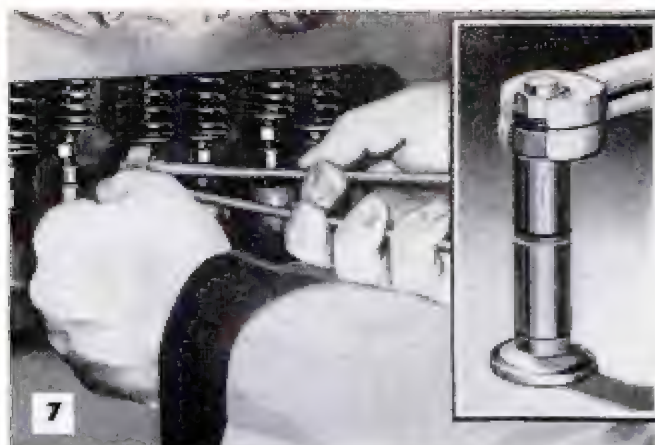
then dropped down to 45 or 50 m.p.h. Actually, this momentary closing of the throttle is very beneficial, as it improves top-cylinder lubrication. As the piston goes down, it creates high vacuum and as air cannot rush in to fill this vacuum due to the throttle being closed, oil is lifted up on piston and rings, improving lubrication.

It is harmful to an engine if it does not start readily or run smoothly, but hard starting is particularly serious in a new engine in which the parts are a relatively tight fit. Gasoline either burns and provides power, or fails to burn and washes away lubricating oil. It does the latter in a slow-starting engine and when the engine finally does start, the pistons, rings and walls lack lubrication. Similarly, if the engine does not run smoothly, due to inefficient combustion, the unburned gasoline dilutes the engine oil, resulting in much the same effect as slow starting. Fig. 6 indicates the various sources of slow-starting trouble. In Fig. 8 the condition of the battery is being checked with a voltmeter.

After a car has run 500 mi., engineers normally have no objection to its being accelerated to 70 or 80 m.p.h. for short periods. However, until the car has 1000 to

1500 mi., it is wise to vary the recommended top speed no more than 10 to 15 m.p.h. It is unwise to open the throttle suddenly or accelerate violently through the gears, as not only should the new engine be protected against unnecessary pressure, but the gear teeth in the transmission and rear axle have not yet worked into a fine running fit. Even though the gears may be lapped at





the factory, the teeth will be able to withstand higher pressure as they develop their own mating surfaces. It is only natural to want to get going in a fine new car, but "jackrabbit" driving may be costly.

As a car warms and cools, tension on the cylinder-head bolts increases and decreases, compressing the head gasket. This is one reason why the car should be returned to the dealer at the end of 1000 mi. to have each head bolt tightened precisely to factory specifications. Uniformity of head-bolt tension is one of the important details to check when servicing a new car.

Another important detail is checking and setting of the valves, Figs. 5 and 7. Improper spacing will interfere with engine performance. Especially during the break-in period, oil-pressure and engine-temperature gauges should be watched closely for any variation from normal. When a drop in oil pressure or rise in engine temperature is noticed, the engine should be stopped immediately and the cause of difficulty corrected to prevent serious and expensive trouble.

Be sure to use the clutch and brakes smoothly during break-in to give their working surfaces a chance to "wear in."

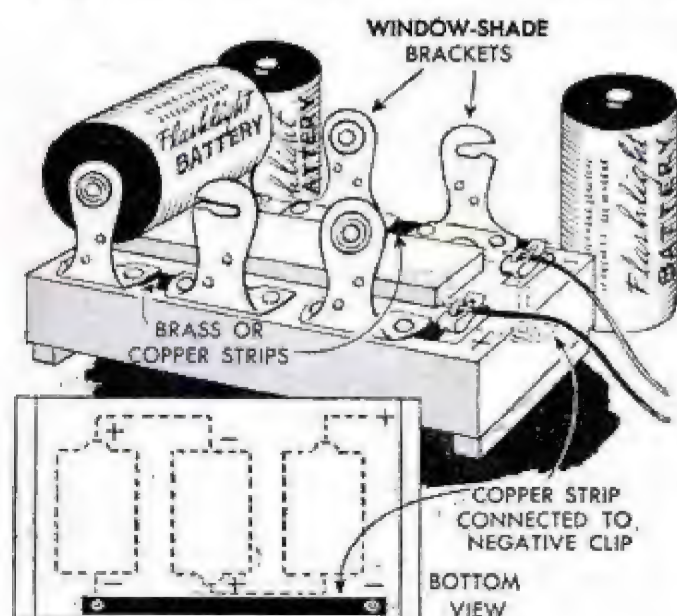


When these parts have developed complete contact, they are more capable of carrying heavy loads than when they are new.

Winter is an ideal break-in time, but it is important to avoid condensation, which always develops unless an engine is run long enough and fast enough to expel the moisture through the crankcase vents. If this is not done, moisture may accumulate in the engine to a harmful degree.

The generator brushes also must wear in to a perfect fit on the commutator. Even though new, they generally will make sufficient contact to recharge the battery without difficulty. However, there is a possibility that one of the brushes may only be making partial contact. Requiring the generator to handle peak output under these conditions may result in serious overheating. So, it is best to "take it easy" with the electrical accessories during the first 1000 mi. just as you do with the mechanical parts of the car. ★ ★ ★

Tiny D.C. "Power Pack" Uses Flashlight Batteries



This small "power pack" will provide $4\frac{1}{2}$ volts of direct current for running small motors, small electroplating jobs, experiments in the chemistry laboratory and many other uses. Using standard flashlight dry cells, the unit is easily constructed. Three pairs of window-shade brackets are mounted on a 3 x 5-in. board to hold the batteries. The slotted side of each bracket is hammered down until only a slight knob is left to contact the zinc bottoms of the batteries. The hole side of the bracket receives the positive terminal of the batteries without alteration. Four strips of thin brass or copper are cut and arranged as shown in the diagram to connect the cells in series. Fahnestock clips attached to one end complete the unit.

George P. Pearce, Albuquerque, N. Mex.

PORTABLE SLIDE VIEWER



READY TO GIVE you an evening of pleasure at a moment's notice, this compact portable slide viewer has its own built-in screen. Simply plug in the lamp, stack the slides in the automatic slide changer and enjoy the pictures on the opal-glass screen $4\frac{1}{2}$ times their normal size. Commercial viewers cost up to \$100 while this one can be constructed for as little as \$10. The viewer is housed in a standard 6 x 10-in. wooden card-file cabinet. However, a suitable box can be made from any type of wood, or even metal. An opening 6 x $6\frac{1}{2}$ in. is jigsawed in the cover and opal glass is mounted on the underside with wood putty. The condenser-lens mounting, part C, is cut from 1-in. wood. If mounted lenses are used, cut a hole to fit the lens housing and insert the housing flush with the face of the mounting board on the side toward the slide changer. If you buy an unmounted set of lenses, mount them as in the diagram, using three or four dabs of wood putty to hold them in place. Do not putty solidly, as they will sweat. Place the condenser mount in the middle of the box temporarily and locate the position of the lamp, which should be a 75-watt enlarger lamp having a bayonet base. The lamp is mounted $1\frac{1}{2}$ in. from the back of the box so that the center of its filament is aligned with the center of the condenser lens. Then prop



By Allan Carpenter

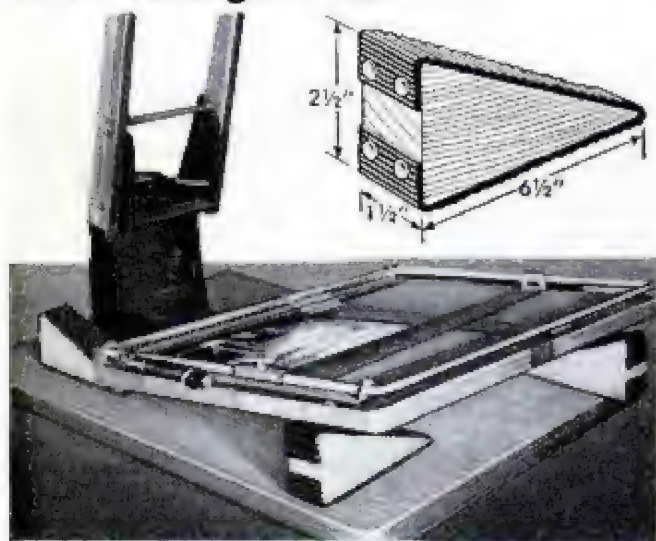
the cover at a 75-deg. angle after lamp is in place and install a mirror at the same angle in the front of the box. Then locate the condenser lens permanently by moving the lens mount back and forth until the image of the lamp filament is projected clearly on the opal glass. Experiment with the angles of the mirror and cover to find the position at which the image is centered on the glass. Screw the condenser mount to the sides of the box and mark the angle and location of the mirror. Construction of the automatic slide changer and the projection lens mount are shown in the details. The projection lens is an f:3.5 with a 2-in. focal length. Place it $2\frac{1}{2}$ in. in front of the condenser lens and put a test slide into the viewer. With the mirror again in place, move the projection lens back and forth until the image is sharp on the opal glass. Then fasten the lens holder in place and mount the mirror with wood putty at the angle indicated by the tests. If there is any distortion at this time, it comes from a slight difference between the angle of the mirror and that of the cover, which then should be adjusted. A panel of $\frac{1}{4}$ -in. plywood, the width of the box interior, serves the dual purpose of shielding the light and holding the cover at the proper angle. Its length is determined by the angle at which the cover must be set. ★ ★ ★

Folding-Camera Neck Strap Is Inexpensive Attachment



Owners of folding cameras who do not wish to invest in a carrying case may enjoy nevertheless many of the advantages of having a case by use of this neck strap. Not only will the strap permit the photographer freedom of both hands, but it also will provide a steady rest for the camera and a safeguard against accidental dropping. Any strong strap about $\frac{3}{4}$ in. wide and long enough to hold the camera at a convenient level will do. Spring snaps for attaching the strap to the handle rings of the camera may be obtained at any hardware store.

Rubber-Covered Wedges To Tilt Enlarger Easel



Tilting an enlarger easel to just the right angle to correct distortion is easy if four rubber-covered wedges are used to block the easel in position. Corrugated-rubber floor matting is stretched over the face and

bottom of each wedge and tacked to the back, as shown in the detail. The corrugations not only hold the easel in place but can be interlocked to permit placing one wedge on top of the other without slipping. The four wedges can be cut from a single piece of $1\frac{1}{2} \times 2\frac{1}{2} \times 13$ -in. stock, first cutting the stock in half transversely and then cutting the two $6\frac{1}{2}$ -in. pieces diagonally.

Ned S. Goss, Wilmington, Ohio.

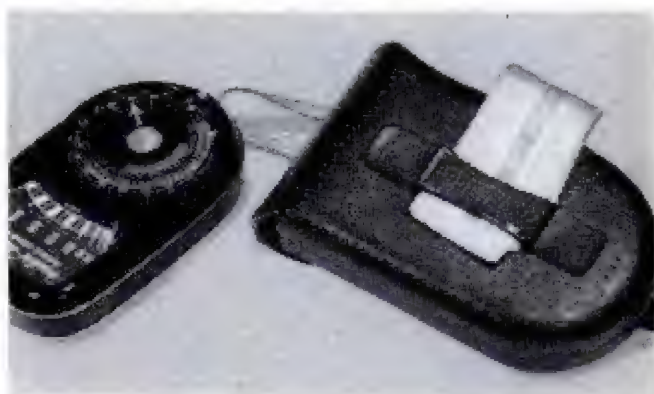
Dustproof Bags for Film Holders



Vinyl-plastic bags of the type in which certain food products are packed make excellent dustproof containers for storing cut-film holders. After inserting the holders in the bag, fold over the open end and secure it with a rubber band. If folded tightly, the bag is also virtually moistureproof.

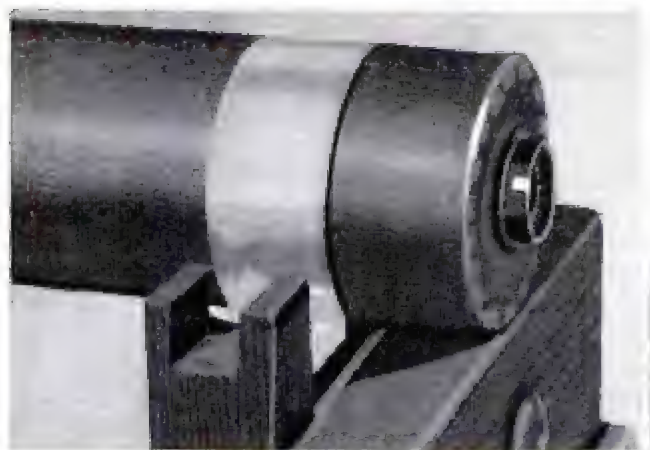
Frank T. Sokolik, Chicago.

Data Chart Held in Belt Loop Of Exposure-Meter Case

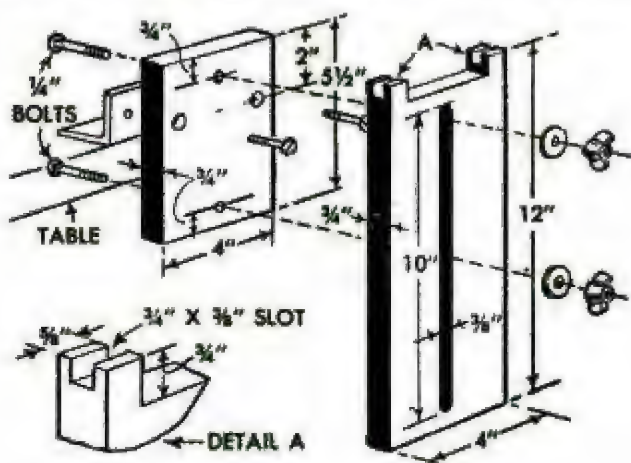


The belt loop on an exposure-meter case is a handy holder for the information chart that comes with each package of film. Especially helpful when using color film, such information as film speeds, exposure data and lighting conditions will be kept conveniently at hand for reference. Chart also will serve to identify the type of film being used.

FRONT SUPPORT FOR EXTENDED CAMERA



Support holds extension tube for photomicrography. Tube is secured by metal collar screwed to support



By John J. Rea

IF YOU USE a plate-back camera with a double-extension bellows for shooting extreme close-ups or in making actual-size copies, you have undoubtedly experienced difficulty in keeping the front of the camera motionless during exposures. Because of the critical focusing and longer exposures necessary in this type of photography, the smallest vibration will seriously affect the definition of the negative image. Thus, great care should be taken to keep the front of the camera perfectly stationary. The adjustable support described here was designed to solve this problem. The dimensions given are for a 9 x 12-cm. Zeiss Ideal camera, but changes can be made easily to suit your individual needs. Two pieces of $\frac{3}{4}$ -in. white pine are used to make the support. These are cut to the dimensions shown in the diagram and drilled for $\frac{1}{4}$ -in. carriage bolts. Holes are also drilled and countersunk in the front block of the support for attaching an angle-steel clamping bracket. A channel, $\frac{3}{8}$ x 10., is cut in the larger block of the support. The top of this block is cut as shown in the diagram, keeping in mind the fact that the cut here should be the width of the runners on the



camera bed. Before assembling the parts, give each a coat of flat-black enamel. To assemble, attach the clamping bracket to the smaller block with flat-headed machine screws and place the two $\frac{1}{4}$ -in. carriage bolts in the holes provided. Then lay the slot of the larger block over the protruding bolts and secure with wing nuts and washers. In use, the support is fastened to the edge of a table with C-clamps placed over the corners of the angle bracket and the tripod-mounted camera with the bellows extended is placed above it. After arranging the subject on the table and setting the camera at the desired height and angle, loosen the wing nuts and raise the back until the runners of the camera bed come to rest in the cutout section of the top. Then tighten the wing nuts. The support is adjustable from 3 to 8 in. above the table top, and by using the upper bolt only, it may be elevated to 12 in. With the camera placed in either a horizontal or vertical position, the unit will hold the front rigidly, and will end the annoyance of not-quite-sharp negatives when working with an extended bellows. Note that the support also serves to hold an extension tube in photomicrography. The tube is secured as shown, with a collar cut from lightweight metal.

Print Dodging Precaution



When using your hands to hold back the light in dodging an enlargement, avoid holding them too close to the lens, especially when working in a cool or chilly darkroom. This precaution is advisable because the warmth and moisture from the hands are apt to cause a thin film of condensation on the surface of the lens which will reduce the sharpness of the print. You can determine a safe working distance under conditions existing in your own particular darkroom by turning on the enlarger and

then holding the hands at various distances for a period of time while watching the lens for signs of condensation.

Virginia Hanson, Los Angeles, Calif.

Protecting Flash-Gun Reflectors

To prevent the possibility of accidentally scratching the polished surfaces of his flash-gun reflectors while carrying them in his camera tote bag, Don Honick, *Popular Mechanics* staff photographer, makes it a practice to protect them with covers made from socks. The feet are cut off worn socks and the ends stitched shut. The type of sock having an elastic top is ideal as the elastic helps to keep the covers from slipping off.



Popular Mechanics Bookshop

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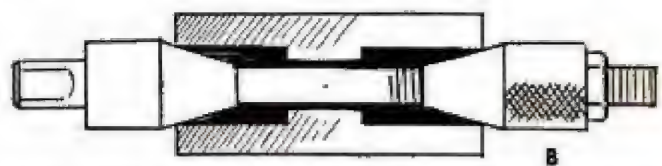
ADJUSTABLE CONE MANDREL

By C. W. Woodson

WHERE THE OUTSIDE diameter of a bushing, sleeve or other tubular piece of work must be machined concentric with the bore, or inside diameter, an adjustable cone is required to mount the work between lathe centers. As you will see in the drawing below, the mandrel consists of a fixed and movable cone which automatically center the work as they engage the ends. The movable tailstock cone is knurled for tightening by hand and is held in position on the threaded mandrel with a locknut. A flat ground at the opposite end of the mandrel permits gripping it with an end wrench while the locknut is adjusted. The mandrel detailed is dimensioned for work having an inside diameter of $\frac{3}{16}$ to 1 in. However, by enlarging the size of the cones and the diameter of the mandrel, work having a larger inside diameter can be accommodated. To make the mandrel, cut the stock to length, center-drill each end and turn as indicated. To thread the mandrel accurately, it is best to use a newly sharpened threading tool, taking a number of light cuts and lubricating with plenty of oil. The adjustable cone is made by knurling, drilling and tapping a bar of tool steel and then turning the cone roughly to shape. After the work is cut off, the cone is screwed onto the threaded end of the mandrel where it is held with a locknut. The mandrel is mounted between centers and a finishing cut is taken to true the cone. This will assure its running concentric with the mandrel when the finished assembly is mounted in the lathe. When the work will permit, break the corners of the bore $\frac{1}{64}$ in. before mounting on the mandrel.



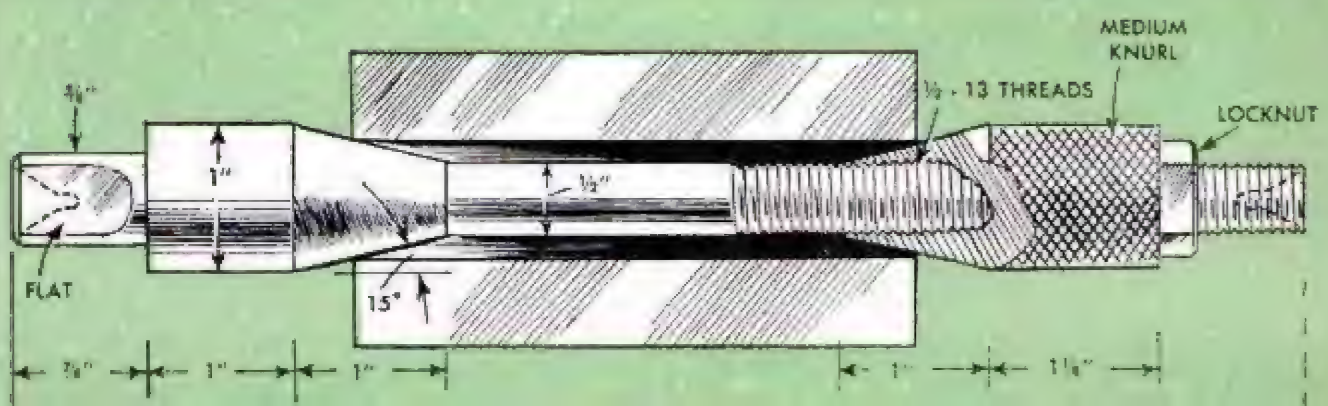
Mandrel holds sleeve having straight bore, as above



Cone mandrel will also handle counterbored sleeve



Tapered bore does not affect alignment of the work



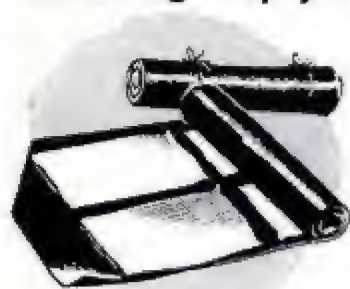


Discarded Auto Tires and Rims Fitted to Tractor Wheels

When replacing worn tractor tires or when changing steel-rimmed tractor wheels to pneumatic wheels, farmers often make use of old auto tires and rims. Short lugs or spokes are welded to the inside of the rim and drilled to fit the bolts in the tractor-wheel hubs. New tubes usually are fitted in the old casings which are then installed on the rims. Old tires no longer suitable for high-speed service on cars frequently will give years of service on light tractors.

A. M. Wettach, Mt. Pleasant, Iowa.

Protecting Empty Grain Sacks



Empty grain sacks on the farm are often neglected or improperly stored, so that many of them are damaged by rats or mice. To store these sacks inexpensively with very little labor, roll them up in a sheet of tar paper. Tie the roll with binder twine and the sacks will be safe from rodents.

Socket-Head-Screw Wrench Improvised in Emergency

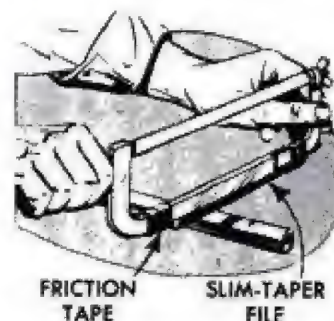
When a suitable wrench for loosening a socket-head screw is not at hand, one can be improvised quite easily from a three-cornered file. All you have to do is cut off the end of the tang to give the right thickness to fit into the screwhead. Then bend the tang at right angles about an inch from the severed end and you will have a wrench that will loosen most screws. It

may be necessary, in some cases, to anneal the file tang by heating it to a cherry red, after which it is submerged in water to cool quickly and retemper it.

Bob Funk, Sacramento, Calif.

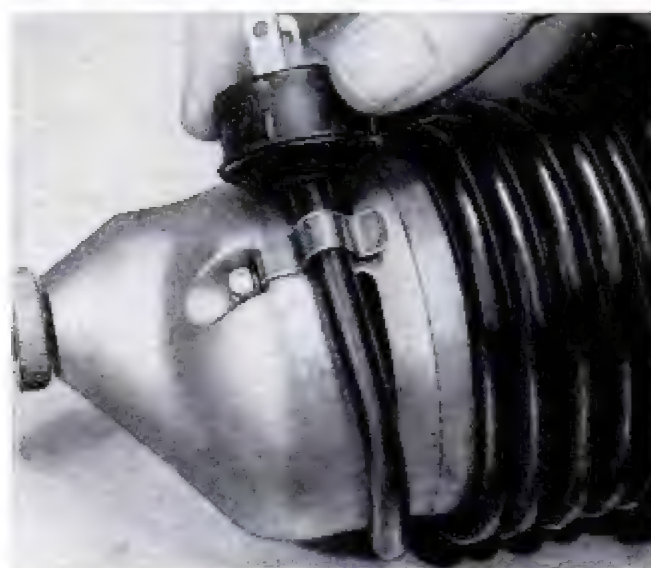
File Taped on Hacksaw Frame Notches Work for Easy Start

The difficulty of starting a hacksaw cut exactly on a scribed mark can be overcome to a considerable extent by taping a three-cornered file to the frame of the saw as shown. With the file mounted



in this manner, it's a simple matter to invert the saw and employ the file in forming a notch at the point to be cut in which the blade may be started easily.

Electric Drill Cord Held By Attached Spring Clip



Tiring of the time-consuming job of coiling an electric-drill cord so that it would fit in his small toolbox, one repairman winds the cord neatly around the body of the drill and slips the free end of the cord under a spring-brass clip as pictured. The clip is permanently attached to the drill by one of the gear-housing bolts, which is removed and inserted through a hole drilled near one end of the clip.

Henry Hanscom, Elmhurst, Ill.

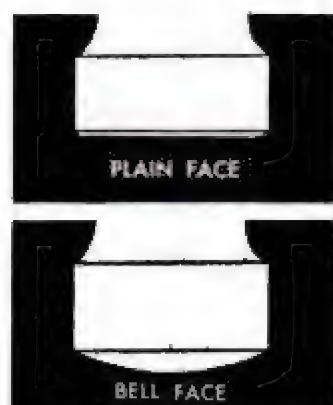
□ A bottle of red nail polish is ideal around a metalworking shop for marking tools, painting arrows on machines and switches, numbering welding helmets, goggles and other items. The lacquer dries quickly and provides a durable marker.



Know YOUR HAMMER

By E. R. Haan

ONE-PIECE HAMMER
WITH LAMINATED
LEATHER GRIP



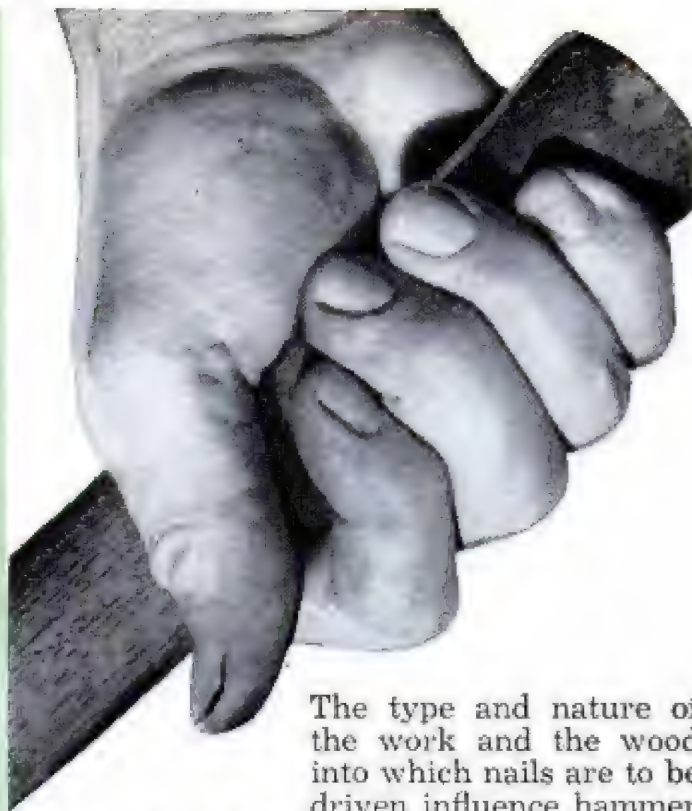
Carpenters prefer hammer
with a bell-faced poll



This is the first in a series of articles giving concise, easy-to-follow information on selection, use and care of common hand tools. Next month, how to use screwdrivers

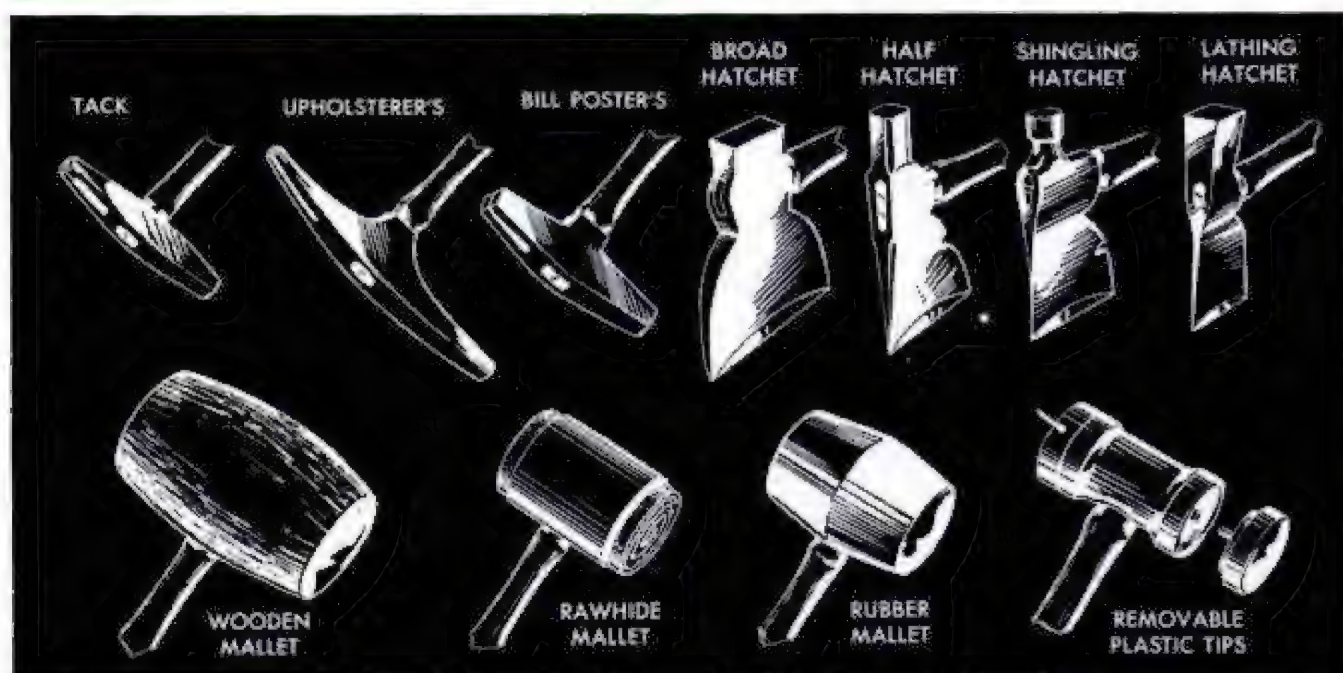
A GOOD HAMMER makes fewer "mistakes" and causes less fatigue than a poorly made one having a cast-iron head and an improperly shaped handle. A quality hammer is tough and durable, the head is heat-treated to give it just the right degree of hardness and the handle is made of straight-grained hickory especially selected and shaped to give the tool correct balance. The face of the poll is polished smooth and the edges are ground to a uniform bevel to prevent chipping. The angle at the neck of the poll gives the head sufficient toe-in to make the tool hang correctly. The claws are ground to "nipper" ends for getting into narrow spaces between nailheads and the surface of the work. A tapered slot between the claws has the right bevel to grip not only the head but also the body of a nail firmly. Handles are shaped to give a certain amount of spring to ease shock and minimize strain on the arm muscles of the user. Handles are flared at the butt ends and in some cases are fitted with rubber tips to afford an easy, nontiring grip. Some hammers have handles of steel, forged integral with the head and fitted with laminated leather disks to form a comfortable, shock-absorbing grip.

Sizes and types of claw hammers: Claw hammers come in various weights, 5, 7, 13, 16 and 20-oz. heads being more or less standard. Some manufacturers also indicate hammer sizes by numbers. These range from 1 to 4, No. 1 being the largest and No. 4 being the smallest. A No. 1½ hammer with a 16-oz. head usually is selected as the size being best for all-around use.



The type and nature of the work and the wood into which nails are to be driven influence hammer size selected for a given job. Hardwoods require a greater driving force and a heavy hammer may be needed to save time and conserve the energy of the user.

Although the face of the poll is always crowned there are variations in the degree of the crown, or convexity. Finishers working on interior trim like a hammer with a pronounced crown, or bell face, on the poll, as this enables them to drive a nail flush or slightly below the surface of the wood without denting it. However, such a hammer requires skillful handling and for ordinary work users generally select a hammer having less crown. Ordinary claw hammers are regularly supplied with two styles of claws. On the first, or common claw hammer, the claws have a pronounced



curve making them especially suited to pulling nails. On the other style the claws are very nearly straight and are heavier which adapts them for prying and for ripping off siding or roofing boards.

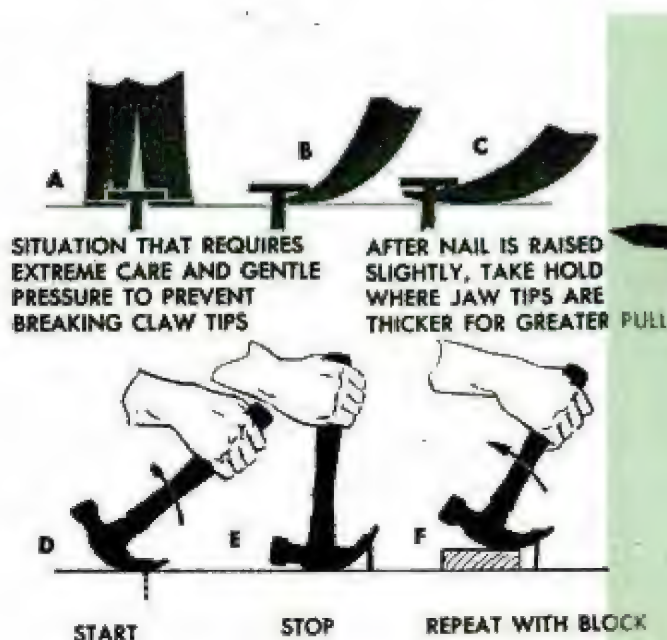
Using a claw hammer: Grip the hammer near the end of the handle. This hold gives the maximum leverage, power and drive. When fine work requires the ultimate in control you'll see experienced users extend the thumb along the handle, especially when handling a light hammer on fine work where the blow that isn't pin-pointed may cause irreparable damage. The trick in starting a nail is to use light taps with the hammer, holding the handle approximately at right angles to the axis of the nail and utilizing the wrist as a pivot. Master this trick and you won't injure your fingers, even when starting nails in difficult positions. After starting, or setting, the nail use the full stroke. When heavy blows are required, the wrist, forearm and upper arm are brought into simultaneous use to deliver the full driving power of the hammer. The movement is timed in such a way that at the moment of impact the hammer handle is in a position approximately at right angles to the axis of the nail, just as in the procedure of starting a nail. As the head of the nail nears the work surface the force of the blows should be lessened as otherwise the nailhead may be sunk below the surface far enough to break the wood fibers. It is particularly important to avoid this when installing wooden siding.

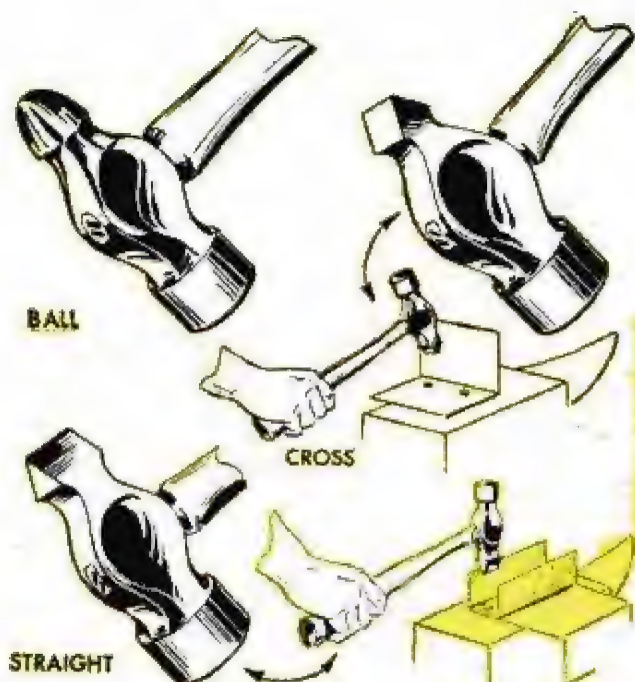
Should a nail bend slightly due to its striking a knot or oblique grain, it usually is possible to correct the condition simply by striking the head of the nail at a slight angle or slightly off center in a direction opposite to that of the bend. In hardwood,

nails frequently start to bend when the point strikes wood grain of greater density. Often the nail can be driven home by striking it a sharp blow at an angle, causing the point to penetrate the adverse grain without increasing the degree of bend. When the character of the work makes it necessary to drive a nail directly through a knot, always drill a pilot hole of a diameter slightly smaller than the body of the nail. In fine work with hardwoods, finishers make a practice of drilling pilot holes before driving and setting finishing nails.

When pulling a nail where the head projects above the surface of the work sufficiently to permit wedging the tip of the claw under it, proceed by stages as undue pressure may break off the nailhead. Raise the nail slightly, then release the claws and take another bite. When pulling a nail, the initial stroke should be stopped just before the poll of the hammer contacts the surface of the work, as the leverage is greatly reduced when the poll becomes the fulcrum. Lift the hammer and insert a block or wedge before applying pressure in the second stage. When using a hammer to pull nails, the pressure always should be moderate to avoid breaking the handle or loosening it in the socket, or eye. When you find yourself in a position with only one hand free you can start a nail easily by gripping the nail and hammer together in one hand. The head of the nail bears against the side of the hammer at the midpoint and a forceful push or a light tap will set the nail so that it will stay in position.

Care of hammer: For the safety of yourself and others who may be near by, never use a hammer with a loose head. Take time to put in new wedges or install a new handle. When the tool is not in use keep





the head oiled to prevent rusting. Wipe off the oil before using.

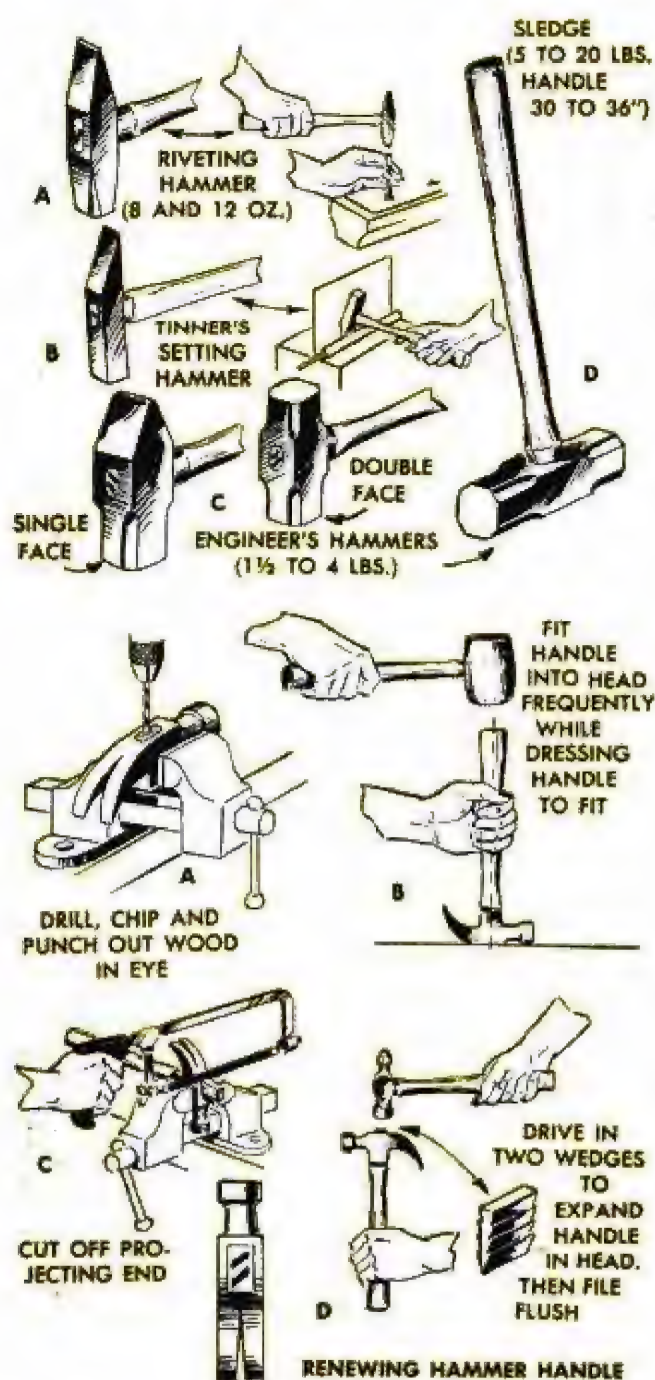
Tack hammers: Use a 5-oz. regular tack hammer, a 7-oz. upholsterer's hammer or an 8-oz. bill-poster's hammer for driving tacks. Hammers having one poll magnetized for holding the tack while starting are preferred by most users. The magnetized poll is used only for starting the tack.

Hatchets: Ordinary hatchets used by lathers and roofers have a polled head with a cross-checked face for driving small nails. The narrow cutting blade is adapted to trimming wooden lath and shingles. The various types are shown on page 234.

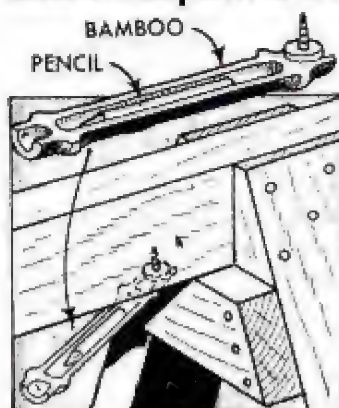
Mallets and soft-faced hammers: Wooden mallets are generally used to drive wood chisels. Soft-faced hammers made from various materials such as rawhide, rubber and plastic are adapted to striking finished or polished surfaces of metal without marring or denting the work. Some types of soft hammers have interchangeable tips of various materials.

Mechanic's hammers: Three types of ball-peen hammers are illustrated, also several types of heavier hammers adapted to bending and riveting of sheet metal, driving cold chisels and similar jobs. Note that the peening hammers shown in the upper left-hand detail have both round polls (ball peen) and wedge-shaped polls (cross and straight peen) which adapt them to peening rivets as well as metal surfaces. Several special types, including engineer's hammers and small sledges are shown in the center details A to D inclusive.

Replacing hammer handles: Details at the lower left, A to D inclusive, show four essential steps in replacing a hammer handle. These steps apply to all types of hammers with only minor variations. When replacing the handle, never burn the old wood out of the eye as the heat may draw the temper of the head. ★ ★ ★

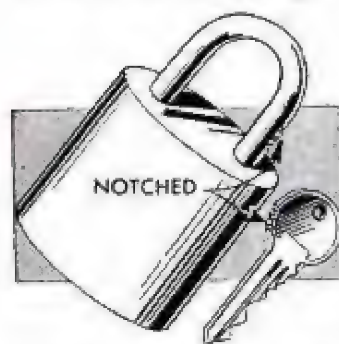


Extra Carpenter's Pencil Kept Handy



as used in a water faucet, is inserted under the head of the screw which is then tightened sufficiently so the pencil tray will not swing out accidentally.

Notches Identify Padlock Keys



Wherever a number of out-buildings or cabinets must be padlocked, selecting the right key for a particular lock often means taking time to try several keys on the ring. To speed identifying the right key, cut a series of notches in the shackles of the locks, using a different number of notches for each lock. Then notch the edges of the keys to correspond with the number of notches cut in the locks. Keep the notches in the shackles shallow so they do not weaken the locks. Even though the notches may not be visible in subdued light, they can be counted by running the fingernail over them.

Section of Garden Hose Slit To Make Riding Quirt



When a short, light whip is needed to drive stubborn cattle, or when it is necessary to improvise a riding quirt, one can be made in a few minutes by cutting a length of discarded garden hose and slitting it in the manner shown in the illustration. The tapering slit produces a thin, flexible lash and the full body of the hose provides a comfortable handle. A dowel can be inserted in the handle to stiffen it, if desired.



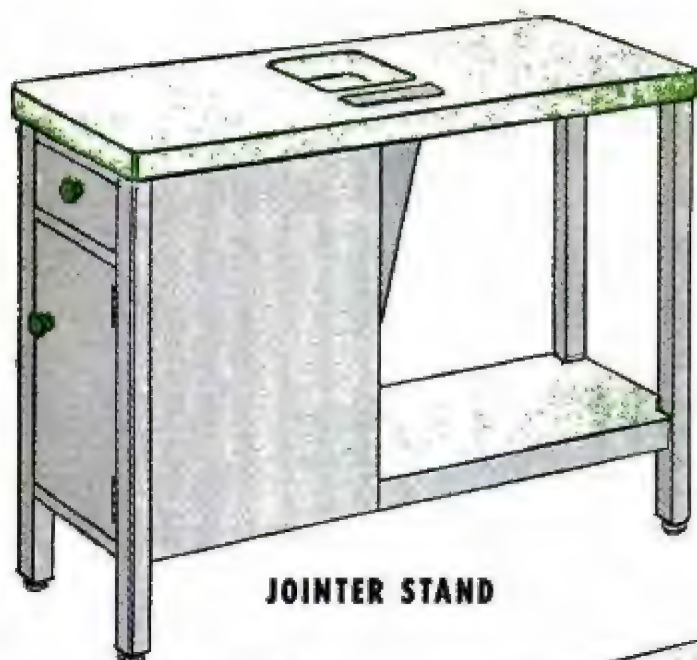
Chain Placed Around Truck Tire Guards Against "Exploding" Rim

As a safeguard against possible injuries to attendants during the removal or inflation of large truck tires, one service-station owner requires that a chain be placed around a tire as shown in case a rim should "explode" from its mounting. Another device used is a welded, tubular frame in which the tire is placed during inflation. In the use of either one, the attendant inflates the tire from the inner side of the wheel. Since rim explosions occur mostly during the inflation of the tire, a check of the seating of the rim after the tire has been inflated to 10-15 lb. also is advised. If the rim is not properly seated, the condition often can be corrected by tapping the rim into position with a mallet. Otherwise, the tire should be deflated again and the operation repeated. Complete deflation of a tire before it is removed from a wheel is one of the most effective precautions against rim explosions. This is especially true on wheels having improperly assembled split-type rims where bolts that secure the rim to the wheel may also be holding the lock ring in place. The simplest, surest way to assure complete deflation of a tire is to remove the valve core.

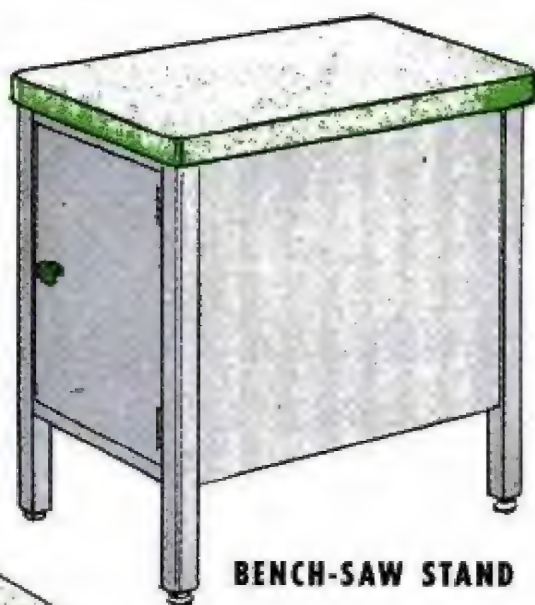
Gene D. Legler, Houston, Tex.

Ruling Compass Adjusted Quickly When Rolled Along Drawing Board

Here's a timesaving tip for draftsmen and artists who have considerable work requiring the repeated use of a ruling compass. Pressed flat against the drawing board, the compass may be adjusted quickly to any width desired by simply rolling it forward or backward on the adjusting-wheel nut.—A. E. Fenn, Chicago.



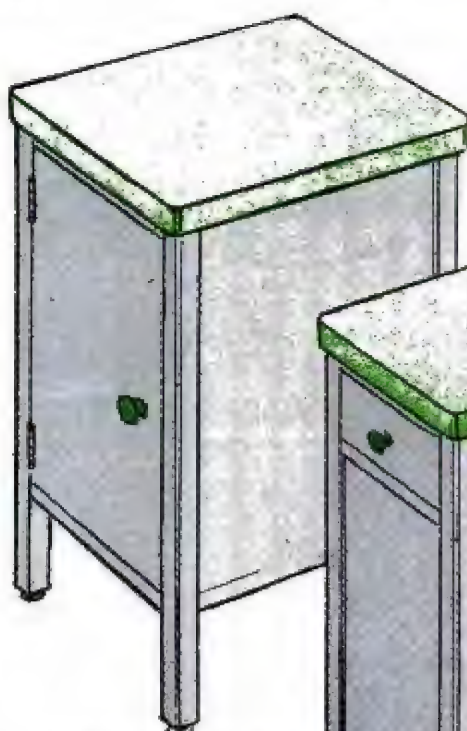
JOINTER STAND



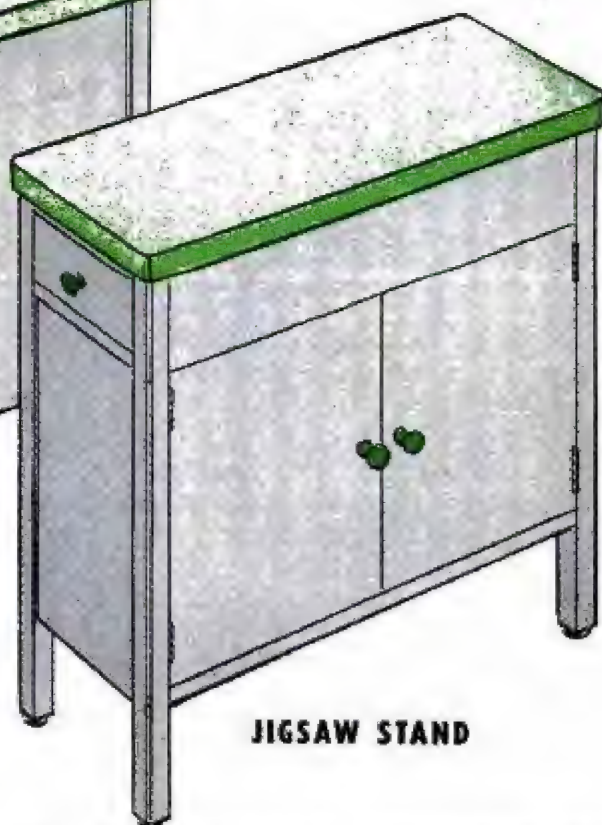
BENCH-SAW STAND



DRILL-PRESS STAND



BANDSAW STAND

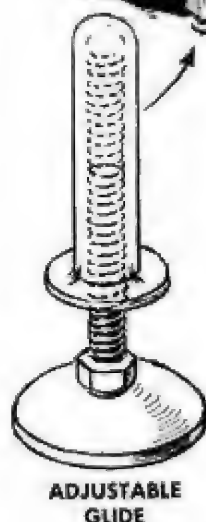
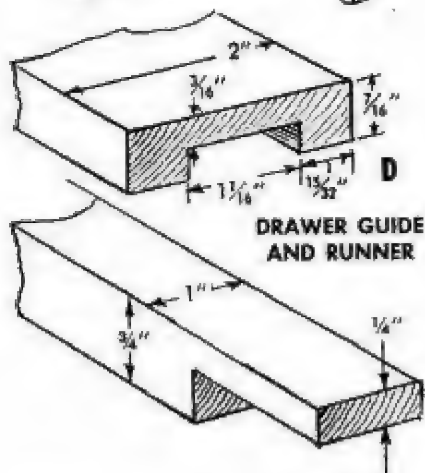
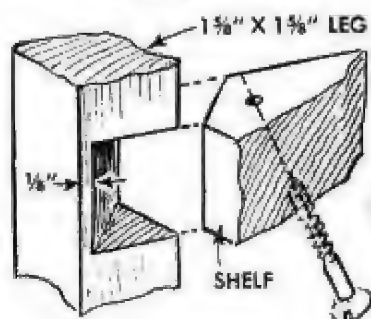
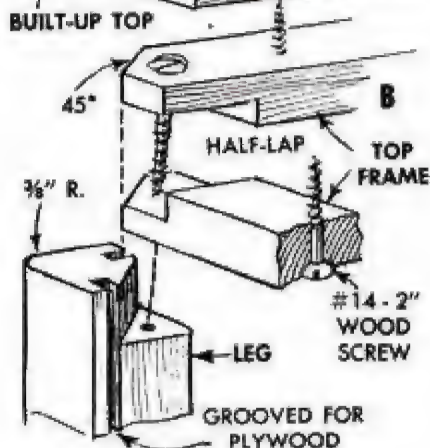
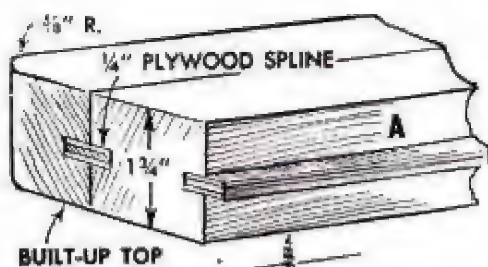


JIGSAW STAND

STANDS FOR YOUR POWER TOOLS

THE FIRST REQUIREMENT for satisfactory operation of a bench-type power tool is a rigid floor stand. These five stands have been especially designed by John Bergen for the most frequently used power tools in the home workshop and provide space for chip disposal and storage of accessories. The legs of each stand are adjustable for height, permitting the units to be leveled on an uneven floor. Basically, the construction of all stands is the same, the tops, legs and rails being joined as in

details A, B and C on the facing page. The drawers slide on the center-runner-and-guide assembly shown in detail D. Dimensions vary with the type of stand and the machine for which it is designed and, in some instances, it may be advisable to depart from those given in order to bring the machine tables to a comfortable height for the individual user. When building the bench-saw and jointer stands, which require openings for discharge of chips and the drive belt, you can save considerable



MATERIAL LIST

Clear Lumber

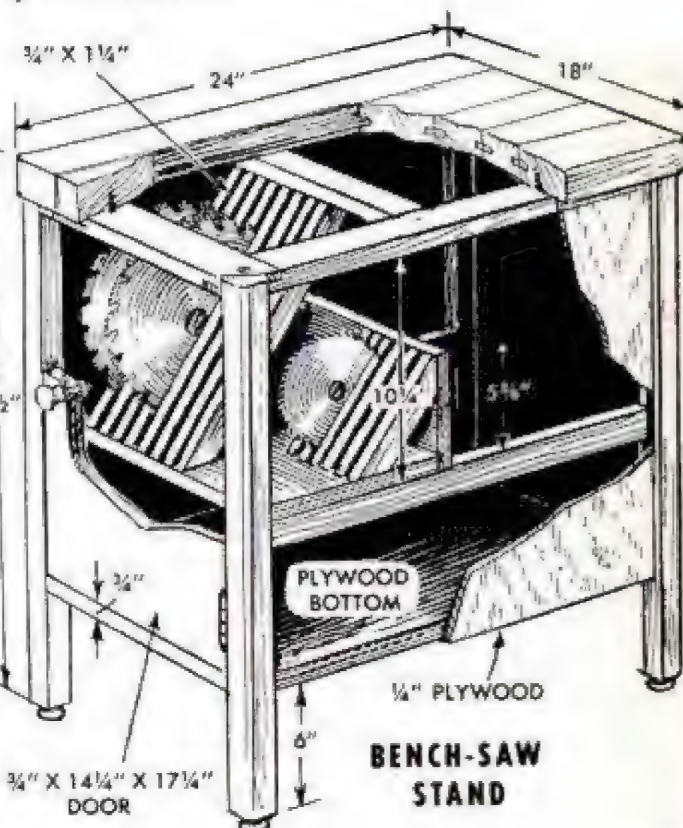
- 1 pc.—1 3/4" x 18" x 24"—Top (built-up)
- 4 pcs.—1 3/8" x 1 3/4" x 25 3/4"—Post
- 2 pcs.—3/4" x 1 3/4" x 23"—Top side frame
- 2 pcs.—3/4" x 1 3/4" x 16 1/2"—Top front center & back frames
- 2 pcs.—3/4" x 1 3/4" x 20 1/2"—Side shelf cleats
- 5 pcs.—3/4" x 1 1/4" x 15 7/8"—Saw-rack rails
- 6 pcs.—3/4" x 1 1/4" x 8 3/8"—Saw-rack rails
- 1 pc.—3/4" x 5 5/8" x 16 1/2"—Shelf back

Plywood

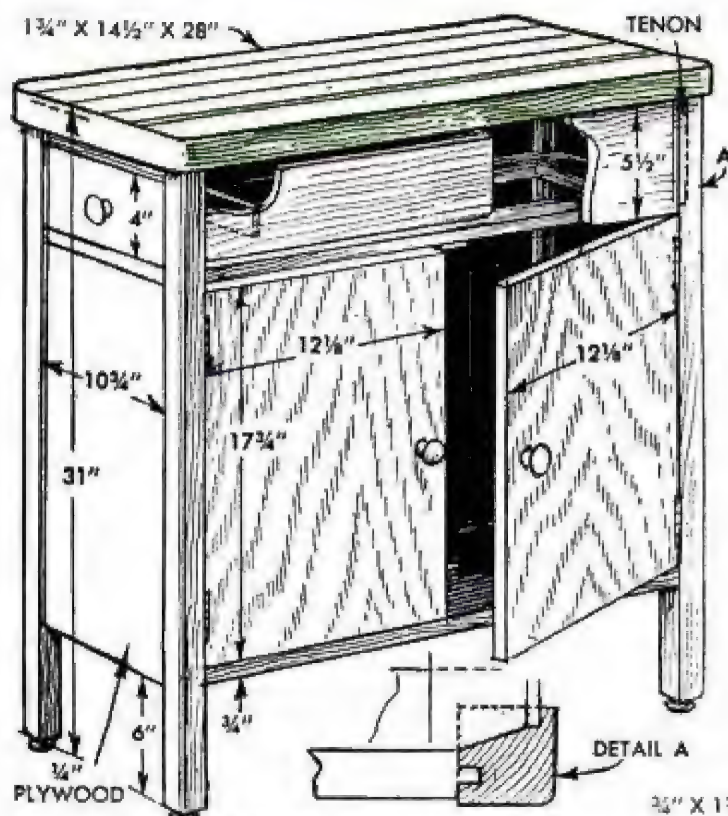
- 1 pc.—3/4" x 14 1/4" x 17 1/4"—Door
- 1 pc.—3/4" x 10" x 16 1/2"—Shelf
- 1 pc.—3/4" x 16 1/2" x 23"—Shelf

Hardboard

- 1 pc.—1/4" x 15" x 18"—Back
- 2 pcs.—1/4" x 18" x 21"—Sides
- 2—Butt hinges, 1 3/4" x 1 1/4" open
- 4—Adjustable glides
- 1—1" dia. knob
- 1—3/4" bullet catch

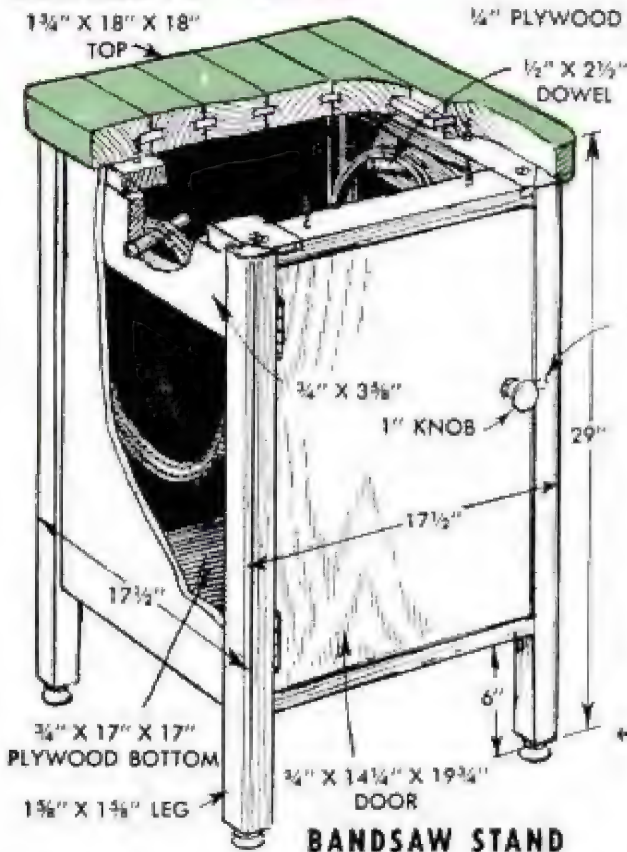


stock by first determining the required size of the openings and then cutting the stock accordingly. In making the top for the jointer stand, for example, you can cut a number of pieces 42 in. long and then use filler strips 17 in. long to form the openings for both chips and the drive belt. Note in detail A the built-up construction of the tops. Either soft wood, such as pine, or hardwood, such as maple or birch, can be used for the tops. The motor shelf on the jointer and lathe stands can be made of the same material joined with glue and plywood splines as in detail A. When cutting stock for the motor shelves and tops, cut each piece slightly longer than the finish dimension to allow for trimming the top to the required size. Tops should be sanded smooth

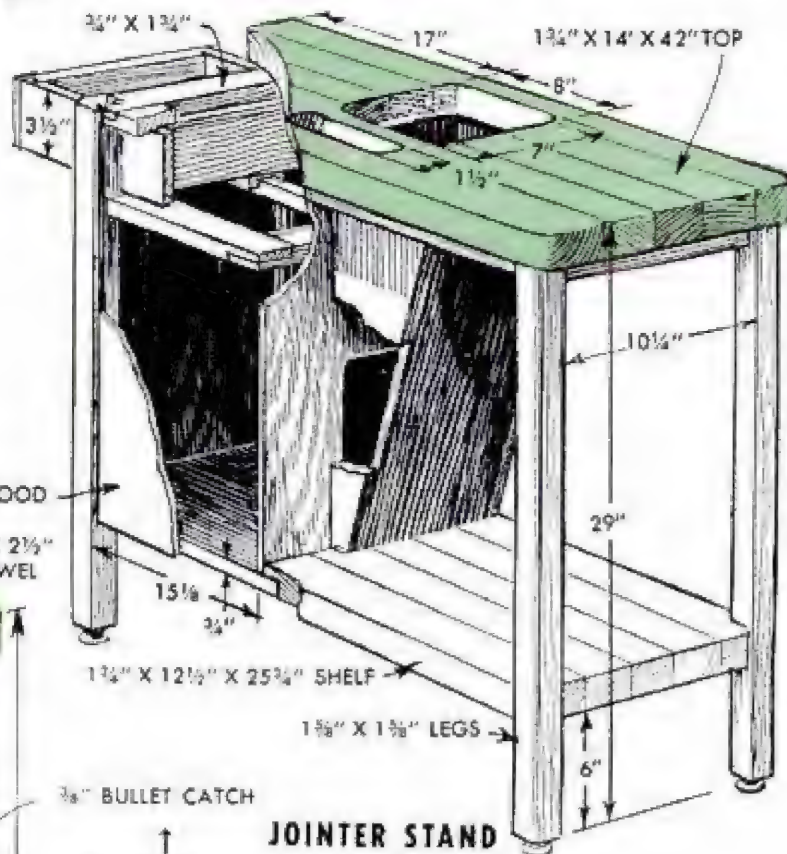


JIGSAW STAND

- Clear Lumber**
- 1 pc.—13 1/2\" x 14 1/2\" x 28\"—Top
 - 4 pcs.—3/4\" x 13 1/2\" x 12 1/2\"—End drawer rails
 - 4 pcs.—3/4\" x 13 1/2\" x 27\"—Side drawer rails
 - 4 pcs.—1 1/2\" x 1 1/2\" x 20 1/2\"—Fists
 - 1 pc.—3/4\" x 5 1/2\" x 25\"—Side rail
 - 1 pc.—3/4\" x 31 1/2\" x 10 1/2\"—Drawer front
 - 1 pc.—1 1/2\" x 31 1/2\" x 10 1/2\"—Drawer back
 - 2 pcs.—1/2\" x 31 1/2\" x 10 1/2\"—Drawer sides
- Hardboard**
- 1 pc.—1/4\" x 31 1/2\" x 9 1/2\"—Drawer partition
 - 1 pc.—1/4\" x 31 1/2\" x 13 1/2\"—Drawer bottom
 - 1 pc.—1/4\" x 11 1/2\" x 18\"—End
 - 1 pc.—1/4\" x 11 1/2\" x 22 1/2\"—End
 - 1 pc.—1/4\" x 20 1/2\" x 25\"—Side
- Plywood**
- 1 pc.—3/4\" x 13 1/2\" x 26 1/2\"—Shelf
 - 2 pcs.—3/4\" x 12 1/2\" x 17\"—Doors
- Hardware**
- 1 pc.—3/4\" x 1\" x 20 1/2\"—Drawer guide
 - 1 pc.—7/16\" x 2\" x 15 1/2\"—Drawer slide
 - 2—3/8\" dia. bullet catches
 - 3—1\" dia. knobs
 - 4—Adjustable glides
 - 4—Bolt hinges, 1 3/4\" x 1 1/4\" open



BANDSAW STAND



JOINTER STAND

- Clear Lumber**
- 4 pcs.—1 1/2\" x 15 1/2\" x 27 1/2\"—Posts
 - 1 pc.—1 1/2\" x 12 1/2\" x 25 1/2\"—Motor shelf
 - 2 pcs.—3/4\" x 21 1/2\" x 4 1/2\"—Side rails
 - 2 pcs.—3/4\" x 21 1/2\" x 12 1/2\"—End & center rails
 - 1 pc.—3/4\" x 11 1/2\" x 10 1/2\"—Drawer front
 - 1 pc.—1 1/2\" x 31 1/2\" x 9 1/2\"—Drawer back
 - 2 pcs.—1 1/2\" x 31 1/2\" x 15 1/2\"—Drawer sides
 - 2 pcs.—3/4\" x 21 1/2\" x 16 1/2\"—Side drawer rails
- Plywood**
- 1 pc.—3/4\" x 10 1/2\" x 15 1/2\"—Door
 - 1 pc.—3/4\" x 12 1/2\" x 18\"—Shelf
 - 1 pc.—3/4\" x 9\" x 10 1/2\"—Dust-chute side
 - 1 pc.—3/4\" x 8 1/2\" x 21 1/2\"—Dust-chute end
- Hardware**
- 1 pc.—3/4\" x 1\" x 15 1/2\"—Drawer guide
 - 1 pc.—7/16\" x 2\" x 14 1/2\"—Drawer slide
- Hardboard**
- 1 pc.—1/4\" x 9 1/2\" x 14 1/2\"—Drawer bottom
 - 1 pc.—1/4\" x 15 1/2\" x 21 1/2\"—Side
 - 1 pc.—1/4\" x 21 1/2\" x 25 1/2\"—Side
 - 1 pc.—1/4\" x 12 1/2\" x 20 1/2\"—End
- Clear Lumber**
- 4 pcs.—1 1/2\" x 15 1/2\" x 27 1/2\"—Posts
 - 2 pcs.—3/4\" x 19 1/2\" x 10 1/2\"—Front & back top frame
 - 2 pcs.—3/4\" x 18 1/2\" x 17\"—Side top frame
 - 2 pcs.—3/4\" x 35 1/2\" x 14 1/2\"—Side cleats
- Plywood**
- 1 pc.—3/4\" x 10 1/2\" x 17\"—Shelf
- Hardware**
- 3 pcs.—1 1/2\" x 15\" x 21 1/2\"—Sides & back

on both sides so that they fit properly on the stands. Drawers in the lathe and drill-press stands are of identical construction; they vary only in overall size and the type of pulls pictured. Note that the lower edge of the drawer front extends a distance equal to the thickness of the rail and that the latter is set in from the corner of the leg a distance equal to the thickness of the drawer front. Made in this way, the drawers close flush. This type of construction makes it possible to use a simple half-lap joint when assembling the rail-and-runner frames as these parts are not exposed in the finished job. It is advisable to use 1/2 or 5/8-in. plywood for the bottoms of the two full-width drawers if they are to be used for storage of heavy objects. Finish the stands in the natural color of the wood or in colors to match the shop equipment. ★ ★ ★

Clear Lumber
1 pc.—1-4" x 4" x 18"—Top (built-up)
2 pcs.—3-4" x 2-3/4" x 12-1/2"—Tray side rails
2 pcs.—3-4" x 1-1/2" x 12-1/2"—Tray side rails
8 pcs.—3-4" x 2-1/4" x 12-3/16"—Side drawer rails
4 pcs.—3-4" x 1-3/4" x 17"—Tray front & back rails
8 pcs.—3-4" x 1-3/4" x 46-1/2"—Front & back drawer rails
1 pc.—3-4" x 2-1/4" x 14-1/4"—Drawer front
2 pcs.—3-4" x 4" x 14-1/4"—Drawer fronts
1 pc.—3-4" x 7-1/2" x 14-1/4"—Drawer front
1 pc.—1-3/4" x 1-1/2" x 13-1/4"—Drawer back
2 pcs.—1-3/4" x 3" x 13-1/4"—Drawer backs
1 pc.—1-3/4" x 6-1/2" x 13-1/4"—Drawer back
2 pcs.—1-3/4" x 1-3/4" x 12-3/4"—Drawer sides
1 pc.—1-3/4" x 1-3/4" x 12-3/4"—Drawer sides
2 pcs.—1-3/4" x 6-3/4" x 12-3/4"—Drawer sides
2 pcs.—1-3/4" x 1-5/8" x 10-1/4"—Front & back tray sides
2 pcs.—3-4" x 1-5/8" x 13-1/4"—Side tray sides
1 pc.—3-4" x 3-1/4" x 15"—Front rail
4 pcs.—1-3/4" x 1-3/4" x 27-1/4"—Posts

4 pcs.— $3\frac{3}{4}$ " x 1" x 12-3/16"—Drawer guides
4 pcs.— $7\frac{1}{16}$ " x 2" x 11 $\frac{1}{4}$ "—Drawer slides
1 pc.— $3\frac{3}{4}$ " x 1" x 14 $\frac{5}{8}$ "—Tray guide

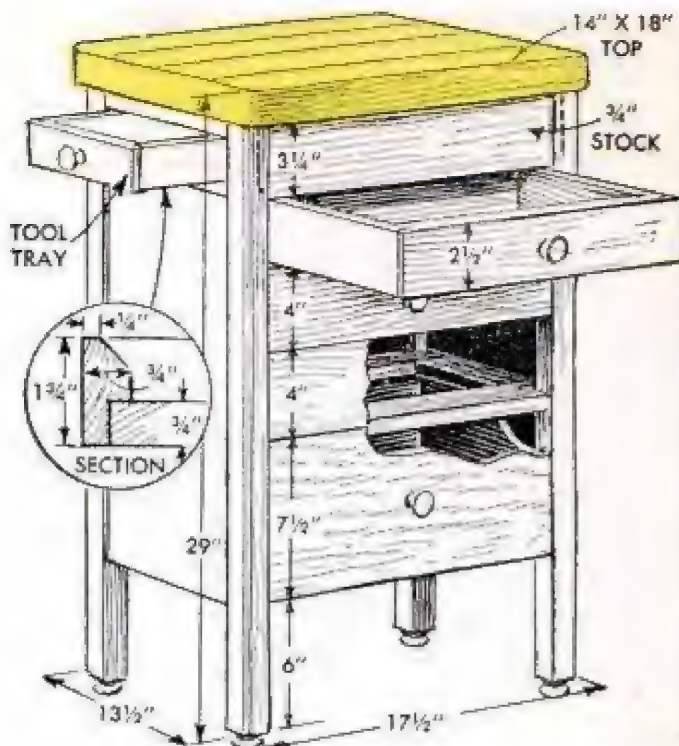
4 pcs.— $1\frac{1}{4}''$ x $11\frac{1}{4}''$ x $13\frac{1}{4}''$ —Drawer bottoms
1 pc.— $1\frac{1}{4}''$ x $15''$ x $21\frac{1}{4}''$ —Back
1 pc.— $1\frac{1}{4}''$ x $11''$ x $21\frac{1}{4}''$ —Side
1 pc.— $1\frac{1}{4}''$ x $11''$ x $17\frac{1}{4}''$ —Side
4— $1''$ dia. knobs
4—Adjustable glides
1— $1\frac{1}{2}''$ dia. knob with wood screw

1 pc.-13 1/2" x 18 1/2" x 60"-Top
1 pc.-13 1/2" x 15 1/2" x 16 1/2"-Motor shelf
4 pcs.-13 1/2" x 15 1/2" x 20 1/2"-Posts
6 pcs.-8 1/2" x 2 1/2" x 57 1/4"-Front & back rails
2 pcs.-8 1/2" x 2 1/2" x 45 7/8"-Bottom front & back rails
3 pcs.-8 1/2" x 2 1/2" x 16 1/2"-Side rails
2 pcs.-8 1/2" x 1 3/4" x 16 1/2"-Side rails
1 pc.-8 1/2" x 1 3/4" x 17 3/8"-Top side rail
1 pc.-8 1/2" x 2 3/4" x 17 3/8"-Top side rail
1 pc.-8 1/2" x 3 1/4" x 16 1/2"-Bottom side rail
1 pc.-8 1/2" x 3 3/8" x 15 1/4"-End rail
1 pc.-8 1/2" x 3 3/8" x 15 1/4"-Back rail
1 pc.-8 1/2" x 1 1/4" x 14 3/8"-End top cleat
1 pc.-8 1/2" x 1 1/4" x 14 1/8"-Back top cleat
1 pc.-8 1/2" x 1 1/2" x 14 1/4"-Front top cleat
1 pc.-8 1/2" x 7 1/2" x 23"-Front facing strip
2 pcs.-8 1/2" x 6" x 20-11/16"-Drawer fronts
2 pcs.-8 1/2" x 8 1/2" x 4 1/4"-Drawer fronts
2 pcs.-1 1/2" x 8 1/2" x 19-11/16"-Drawer backs
2 pcs.-1 1/2" x 7 1/2" x 19-11/16"-Drawer backs
4 pcs.-1 1/2" x 5 1/4" x 16 7/8"-Drawer sides
2 pcs.-1 1/2" x 7 3/4" x 16 7/8"-Drawer sides
1 pc.-8 1/2" x 2 3/4" x 16 1/2"-Center rail
1 pc.-8 1/2" x 1 3/4" x 14 1/8"-Tool rack

4 pcs.— $3\frac{1}{4}"$ x $11\frac{1}{4}"$ x $185\frac{1}{4}"$ —Drawer guides
4 pcs.— $1\frac{1}{2}"$ x $23\frac{1}{2}"$ x $15\frac{1}{2}"$ —Drawer slides
6 pcs.— $3\frac{1}{4}"$ x $11\frac{1}{2}"$ x $4\frac{1}{2}"$ —Pulls

1 pc.— $3\frac{1}{4}"$ x $165\frac{1}{8}"$ x $23"$ —Side
1 pc.— $1\frac{1}{4}"$ x $145\frac{1}{8}"$ x $23\frac{1}{4}"$ —Tool-rack panel

1 pc.— $1\frac{1}{4}''$ x $151\frac{1}{2}''$ x $231\frac{1}{2}''$ —Side
2 pcs.— $1\frac{1}{4}''$ x $16''$ x $19-11/16''$ —Drawer bottoms
2 pcs.— $1\frac{1}{4}''$ x $16''$ x $403\frac{1}{8}''$ —Drawer bottoms
1 pc.— $1\frac{1}{4}''$ x $233\frac{1}{4}''$ x $42\frac{1}{2}''$ —Back



The image contains two sets of technical drawings for a wooden drawer. The top set is the 'SIDE VIEW', showing the 'FRONT' and 'BACK' of the 'DRAWER SIDE'. It includes a vertical dimension of $3\frac{1}{8}"$ for the front panel and a horizontal dimension of $5\frac{1}{2}"$ for the back panel. The bottom set is the 'TOP VIEW', showing the 'FRONT' and 'BACK' of the 'DRAWER BOTTOM'. It includes a horizontal dimension of $15\frac{1}{2}"$ for the back panel and a vertical dimension of $1\frac{1}{2}"$ for the side panel.

LATHE-STAND DRAWERS

TOP VIEW

60"

18 1/2"

1 3/4"

3/8" X 3 3/8"

12"

14 1/8"

1 3/8" SQ.

MOTOR SHELF, 1 3/4" STOCK

41 3/8"

31 1/2"

8 1/2"

8 1/2"

6"

14 3/4"

1/4" OVERHANG

LATHE STAND

3/4" HOLE

1" COUNTERBORE, 1/4" DEEP

2"

3/8"

1 3/4"

1 1/16"

TOOL RACK

4 1/2"

1 1/2"

3/4" R.

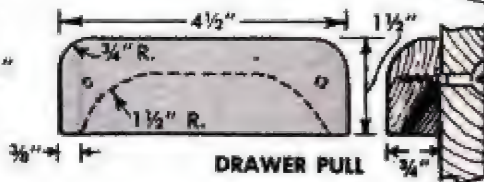
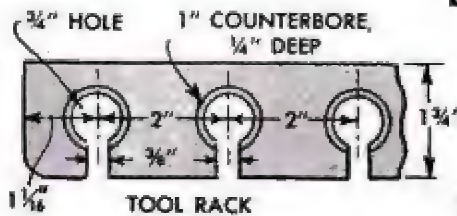
1 1/2" R.

3/8"

DRAWER PULL

3/4"

LATHE STAND



Operator Rides Small Lawn Roller To Provide Necessary Weight



To avoid the problem of handling and storing a heavy, cumbersome lawn roller, one gardener made a lightweight roller from a 3-ft. length of 7-in. well casing. This is mounted on a frame of $\frac{3}{4}$ -in. pipe which is fitted with a hitch so it can be towed behind a garden tractor. Pieces of flat steel are welded to the ends of the frame to provide footrests. In use, the operator rides on the roller as shown to weight it.

John Krill, North Lima, Ohio.

Tire Mounted on Service Truck Prevents Scratched Bumpers



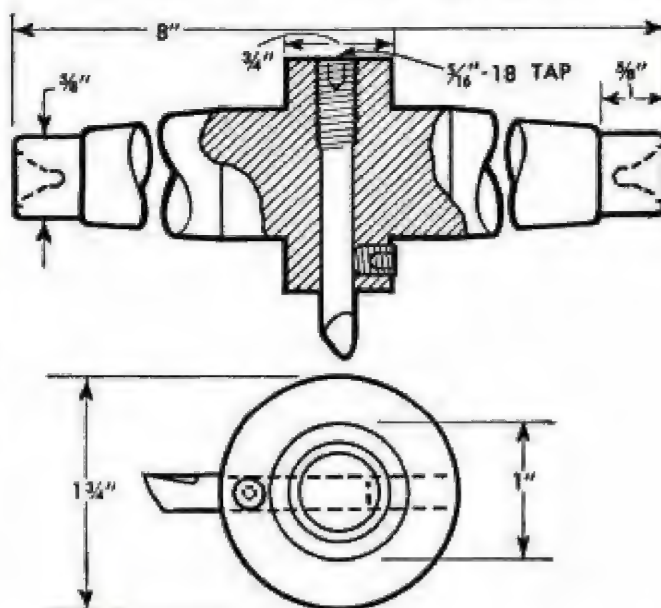
To eliminate the possibility of scratching bumpers on stalled cars being pushed, one service-station operator installed an inflated tire on the front bumper of the service truck. The tire, which is mounted on a wheel, is attached with three $\frac{1}{2}$ -in. bolts inserted through holes drilled in the bumper. Another feature of this arrangement is

that trailer hitches on car bumpers will fit into the recessed portion of the wheel.

Bob Plyler, Statesville, N. C.

Large-Diameter Holes Drilled With Adjustable Boring Bar

Accurately boring large holes in work which must be mounted on the cross-slide boring table of the lathe is a simple matter with the boring tool shown in the detail. Mounted between centers, the tool is driven by a lathe dog and the work is either hand or power fed to the cutting tool by the carriage. After each cut, the tool bit can be advanced by turning the adjusting setscrew and then locked firmly in position by tightening the locking setscrew. The size of the boring bar will be



determined by the work at hand, the dimensions shown in the drawing being suitable for holes 2 to 3 in. in diameter. The heavy arbor is made of cold-rolled steel, center-drilled on the ends and turned to shape. It then is cross-drilled for the $\frac{1}{4}$ -in. bit and the hole is tapped to a depth of $\frac{3}{4}$ in. for the adjusting setscrew. The flange is drilled and tapped for the setscrew that locks the tool bit in position. Round tool bits are used in the boring bar, but if the hole is filed or broached square, regular lathe tool bits may be used.

C. W. Woodson, Chicago.

Preventing Countersink Chatter

The ordinary fluted countersink used in a drill press or portable electric drill has a tendency to chatter when countersinking hardwood, leaving a badly ribbed hole instead of the smooth taper desired to seat a screwhead. This tendency can be offset by blocking up the work so that the portion to be countersunk is supported over an open space.

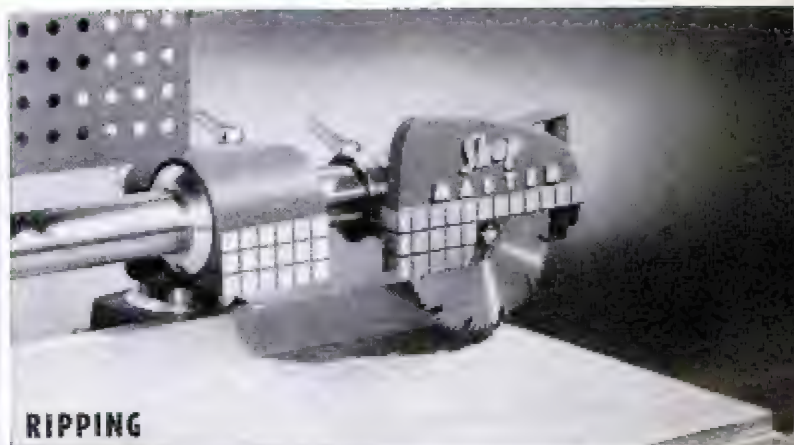
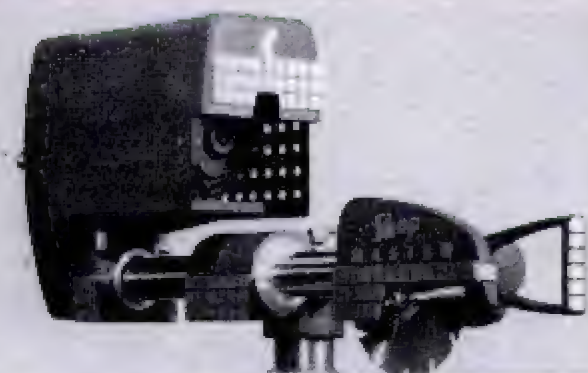


WRENCH KIT for socket-headed setscrews, also Phillips-head screws, contains five interchangeable wrenches and drivers and a handle with chuck, or collet. Handy container has transparent dome-type cover, base is designed to hold tools

SHOPPING FOR TOOLS

HAND-OPERATED PRINTING PRESS shown at right comes completely equipped with rollers, chase, font of type, ink, cards and furniture

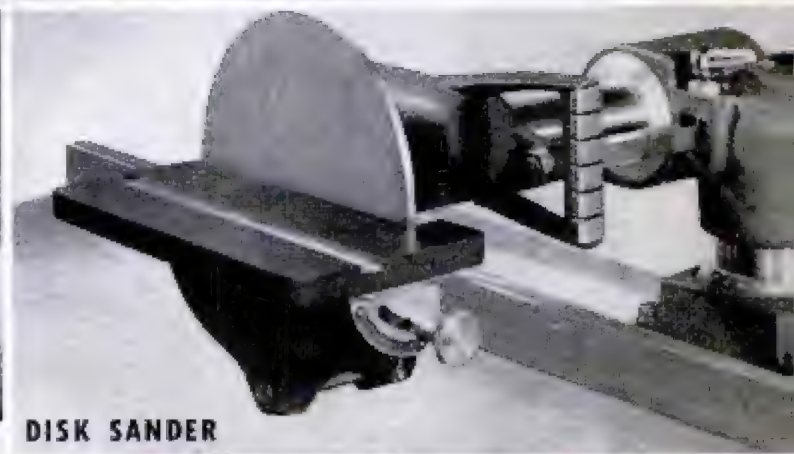
RADIAL SAW pictured in photos below does all common radial-saw operations such as ripping, crosscutting, grooving, cutting compound angles and miters. Universal movement of the head permits such unusual operations as sawing a concavity to a depth of 1 in. or more as in the center left-hand photo. In addition, the machine is converted quickly by means of accessories to such operations as disk and belt sanding, drilling and routing, faceplate turning and driving other machines by means of a pulley attached to the angle head



RIPPING



SAWING CONCAVITY



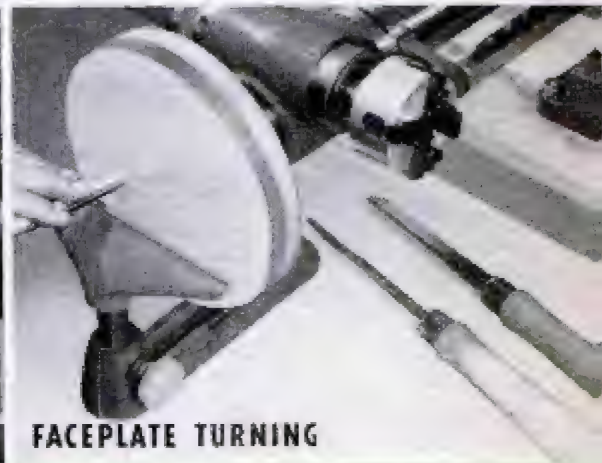
DISK SANDER



BELT SANDER



DRILL PRESS



FACEPLATE TURNING



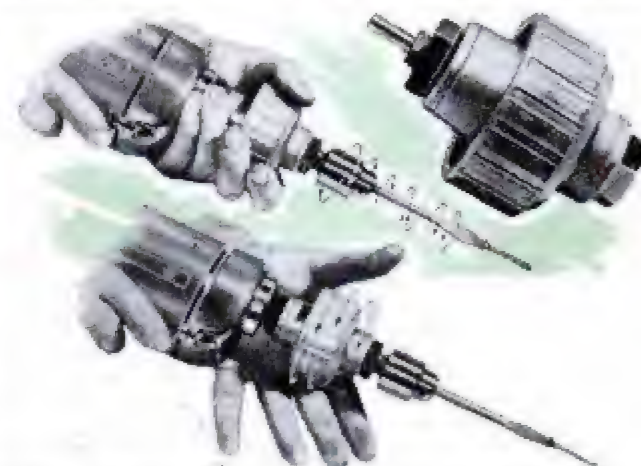
TRAILING CASTER on warehouse truck supports part of the load and permits operator to release handles of the truck which remains in traveling position. Caster frame is sprung to the truck frame and pivots on axle



THREE-SPINDLE TURRET fits any drill press and is indexed by a hand lever without stopping machine. Tools will not rotate until indexed and locked automatically. Unit attaches to drill-press spindle sleeve

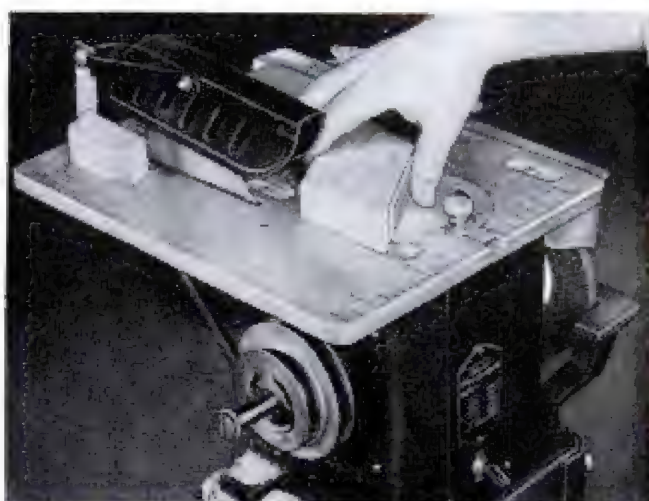


ORNAMENTAL CAP snaps into place after driving screw into wood, covering the screwhead completely. This eliminates the need for counterboring screw holes for wooden buttons. Screws have specially designed socket heads and require use of a special socket driver



SPEED REDUCER for $\frac{1}{4}$ -in. portable drills utilizes a planetary-gear system instead of a friction clutch. Attaches directly to spindle or may be used in chuck. Started or stopped simply by gripping or releasing by hand while drill is running. Prevents tool breakage

COMBINATION POWER TOOL for small shops combines circular saw, jointer, shaper, disk sander and tool grinder in one compact unit measuring 13 x 15 x 16 in. over-all and weighing only 50 lb. with $\frac{1}{2}$ -hp. motor. Several useful accessories are available as shown in the left-hand photo below. In right-hand photo tool is pictured in use as a circular saw cutting a miter. Unit can be quickly set up as grinder, saw, sander or jointer without any major changes. Grinding wheel is fitted with guard. Arbor takes wire wheel and buffer

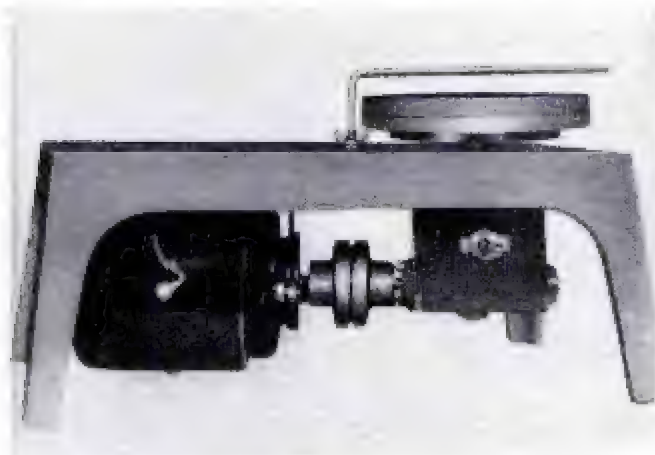




CAM-TYPE VISE is designed to hold small parts for assembly by soldering, brazing, also by small screws and bolts. Universal joint enables operator to locate work in any convenient position. Jaws open $\frac{3}{8}$ in.



INTERCHANGEABLE REAMERS cut replacement costs and save time on work that requires use of more than one reamer per setup. Reamers interchange on spindle



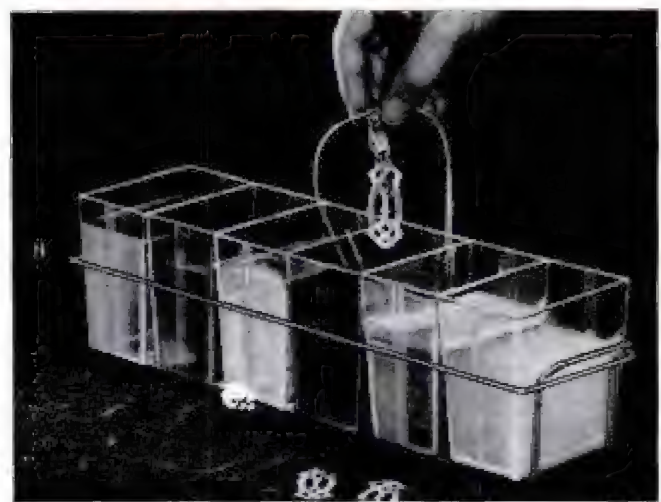
HONING MACHINE dresses cutting tools to a smooth, keen edge without drawing temper. Motor-driven circular stone has fine and coarse faces, lies flat on a circular disk, or table, which rotates at a uniform speed. Tool rest is adjustable for correct height

VACUUM CLEANER for cars gets its powerful suction from the vacuum system of the car itself, as it is connected into the vacuum line to the windshield wipers. All-plastic suction head fits hand comfortably and picks up dust, sand and lint from floors and fabric

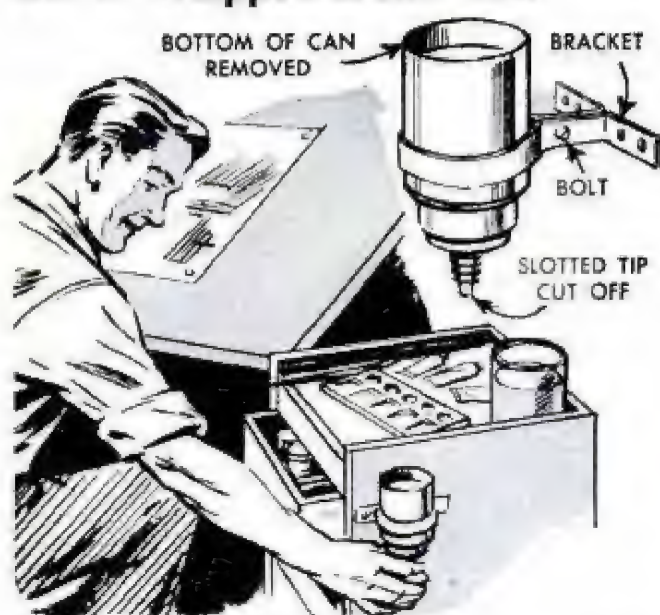


DIMENSIONAL AIR GAUGE has exceptional measuring range and clearance combined with the required stability. Gauges irregular and tapered holes within .003 in. Setting of the gauge is rapid and positive as the master jet requires no complicated adjustments

ELECTROPLATER requires no outside source of current. Plating chemicals generate current for plating common metals with copper, zinc or simulated chrome. Plating solution is nontoxic and nonflammable. Although practical, unit is not intended for industrial use

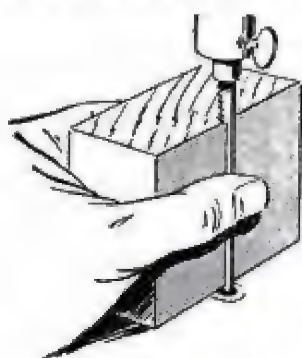


Artist Makes "Water Fountain" Out of Whipped-Cream Can



In order to have a supply of water close to my drawing board without piping it or using a large open container, I converted a pressure type, whipped-cream can to provide a "water fountain" that I find exceptionally handy. The bottom of the can is removed after which the can is mounted in a vertical position by means of a clamp. This is made from sheet metal or thin flat iron and is bent to the shape indicated in the upper detail. The assembly is mounted on a wall or other place convenient to the drawing board. In use, all that is necessary is to move the small valve to one side as you do when using it as a whipped-cream dispenser.—Allen Atkins, San Rafael, Calif.

Grooved Block Aligns Jigsaw Blade For Accurate Chucking



A jigsaw blade cuts best when it is mounted perpendicularly in the chucks. While most machines have provision for aligning the chuck jaws to bring the blade exactly vertical sidewise, it is up to the operator

to see that the blade has no forward or backward rake. A squared test block cut from hardwood and grooved for the blade makes it easy to chuck the blade accurately. After the blade is inserted through the opening in the table and placed in the chucks, it is held in the groove in the block with the thumb. While held in this manner, the lower chuck is tightened and the upper one is pulled down to provide proper ten-

sion. Needless to say, the groove in the block must be cut at an exact 90-deg. angle and the width of the groove must be cut just slightly wider than the thickness of the blade. Perhaps the easiest way to cut such a narrow groove is to run a shallow rabbet on one edge of two blocks and then glue them together, face to face.

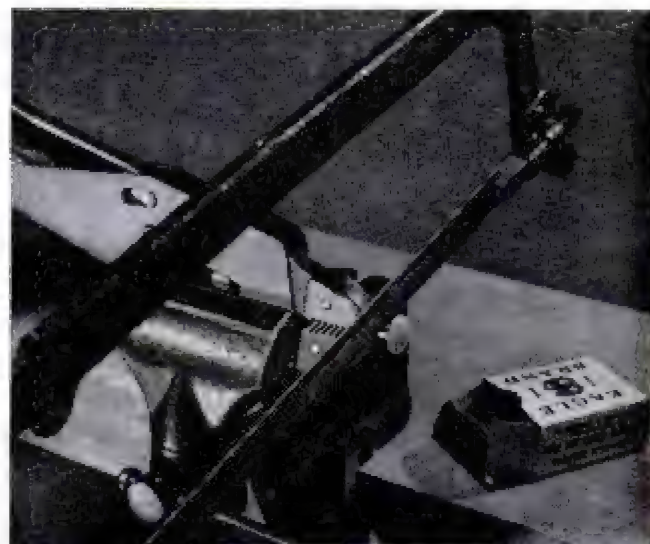
Scraper on Janitor's Push Broom Made From Corrugated Hose

Janitors and others who clean public buildings with a push broom will find that a scraper made from a piece of corrugated hose and nailed to the back of the broom will enable them to remove bits of paper and other debris that have a tendency to adhere to the floor. The scraper also is handy for shifting small linoleum mats about the floor without stooping to pick them up. Scraper is made by slitting a piece of the corrugated hose and tacking it to the broom as indicated. Be sure the nails or tacks are sunk into the rubber so there is no possibility of scratching any surface on which the scraper is used.



Lock Wrench Held in Bench Vise Grips Work While Cutting

Experiencing difficulty in holding rivets in a bench vise for cutting, one craftsman placed them in a lock wrench which then was gripped in the vise jaws. Only the lower jaw of the wrench is secured in the vise, thus permitting it to be opened when changing from one rivet to another.



COMMUNICATIONS-TYPE RECEIVERS FEATURE DUAL CONVERSION

IMPROVEMENTS in communications receivers have been announced by several of the large manufacturers. Many of these have been due to the demands of the armed forces for more efficient equipment. Commercial operators, hams and short-wave listeners are more critical of the performance of their receivers for several very good reasons. The number of stations on the air is increasing steadily, new sources of interference pop up every day and these problems keep the radio laboratories on their toes.

The latest addition to the well-known HRO series is the HRO-Sixty illustrated in photos A, B and D. The manufacturer has provided dual conversion on all frequencies above seven megacycles plus 12 permeability-tuned circuits in the three 456 kilocycle I.F. stages. Dual conversion results in a sharp reduction in image response; it is a method whereby a high-frequency signal is converted to a relatively low intermediate frequency and amplified in two steps to obtain a high degree of selectivity. Photo A shows Calvin F. Hadlock, W1CTW, a prominent ham and radio engineer of Arlington, Mass., tuning in some distant stations on his HRO-Sixty. Photos B and D show front and interior views of this new model. The inset photo is of the same set installed in a rack with the speaker. The rack includes a compartment for 10 drawer-type coil units covering all bands.

The new NC-183-D illustrated in photo C is in a lower price range and features dual conversion on the 6, 10, 15, 20 and 40-meter ham bands. It also has 12 tuned I.F. circuits.



TWENTY-WATT SUPER-FIDELITY AUDIO

By Dr. Richard C. Hitchcock

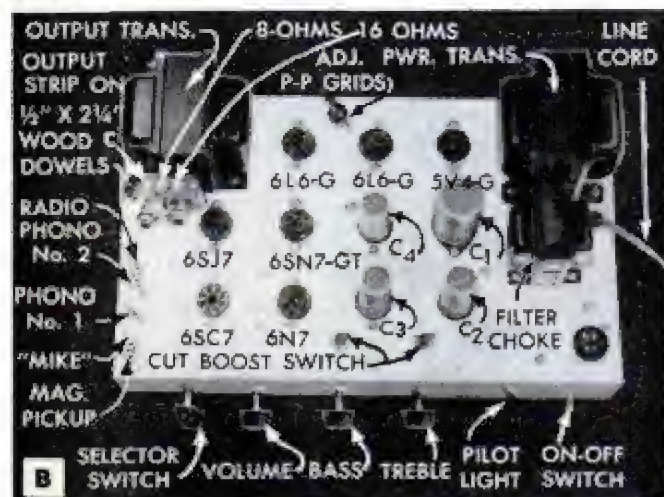


WITHOUT A DOUBT this audio amplifier has greater undistorted output than most triode circuits; it has twice the power of type-807 triode amplifiers. The measured output is 20 watts using 6L6-G push-pull pentodes with less than five percent intermodulation distortion (IMD). At 10 watts output the IMD is below one percent. Designed especially for the readers of *Popular Mechanics Magazine* who are interested in high-fidelity reproduction, this amplifier can be used with any good loud-speaker system, such as the nested loudspeakers described in the November 1952 issue, or with the two-way system that appeared in the May 1952 issue. However it will give highly satisfactory results with any good single PM speaker in an ordinary enclosure. The special speaker systems are for the constantly increasing group of critical high-fidelity enthusiasts.

Of course, the ideal loudspeaker system will only reflect the quality of the audio signal that is fed into it. The amplifier described here is not difficult to build and will meet the requirements of the most critical experimenter in high-fidelity-sound reproduction. The output is sufficient to drive up to eight 8-in. speakers in series or series parallel at 20 watts for home or auditorium purposes.

All parts are mounted on the 3 x 10 x 17-in. standard-size chassis detailed in Fig. 3. The weight, without the carrying case, is 25 lb.; case weighs 9 lb. when made of white-pine plywood. The trim is $\frac{3}{8}$ x $\frac{3}{4}$ -in. mahogany strips. Complete details for its construction are given in Fig. 4. Photos B and F are top and bottom views of the completed amplifier chassis; photos A, C, D and G show the final assembly in the case.

The schematic circuit diagram is given in Fig. 1 and a complete pictorial wiring



CAPACITORS

- 1-ELECT. 40-40-MFD. 450-V. FP-262 MALLORY.....(C1)
- 1-ELECT. 20-20-MFD. 450-V. FP-234 MALLORY.....(C2)
- 1-ELECT. 10-10-10-MFD. 450-V. FP-389 MALLORY.....(C3)
- 1-ELECT. 40-40-MFD. 150-V. FP-212 MALLORY.....(C4)
- 2-ELECT. 50-MFD. 25-V. MALLORY TC-29.....(C10 & C15)
- 4-PAPER-TYPE .05 MFD., 600-V.....(C5, C7, C11 & C13)
- 2-PAPER-TYPE .01 MFD., 600-V.....(C6 & C12)
- 1-PAPER-TYPE .001 MFD., 600-V.....(C14)
- 1-MICA-TYPE .0001 MFD.....(C16)
- 2-MICA-TYPE .0002 MFD.....(C17 & C8)
- 2-PAPER-TYPE .02 MFD., 600-V.....(C9 & C19)
- 2-PAPER-TYPE .1 MFD., 600-V.....(C20 & C21)
- 1-PAPER-TYPE .5 MFD., 400-V.....(C18)

RESISTORS

- 1-7000-OHM, 50-WATT ADJ., W.W.....(R1)
- 1-200-OHM, 50-WATT FIXED W.W.....(R2)
- 1-225-OHM, 10-WATT FIXED W.W.....(R3)
- 1-50-OHM, POTENTIOMETER W.W. LINEAR.....(R4)
- 1-1/2-MEG. LOG. (VOLUME) CONTROL.....(R5)
- 1-1/2-MEG. LINEAR (BASS) CONTROL.....(R6)
- 1-1/10-MEG. LINEAR (TREBLE) CONTROL.....(R7)
- 2-100-K CARBON 1%, MATCH 1-WATT.....(R8 & R9)
- 3-10-K CARBON 10%, 1/2-WATT.....(R10, R39 & R40)
- 2-3.9-MEG. CARBON 10%, 1-WATT.....(R11 & R12)
- 1-27-K CARBON 10%, 1-WATT.....(R13)
- 1-200-K CARBON 10%, 1-WATT.....(R14)
- 1-47-K CARBON 10%, 1/2-WATT.....(R15)
- 2-68-K CARBON 10%, 1-WATT.....(R16 & R17)
- 1-100-K CARBON 10%, 1/2-WATT.....(R18)
- 1-51-K CARBON 10%, 1/2-WATT.....(R19)
- 3-33-K CARBON 10%, 1-WATT.....(R20, R21 & R29)
- 1-2200-OHM CARBON 10%, 1/2-WATT.....(R22)
- 4-100-K CARBON 10%, 1-WATT.....(R23, R25, R34, R35)
- 1-22-K CARBON 10%, 1-WATT.....(R24)
- 1-6800-OHM CARBON 10%, 1-WATT.....(R26)
- 1-10-K CARBON 10%, 1-WATT.....(R27)
- 1-2200-OHM CARBON 10%, 1-WATT.....(R28)
- 1-270-K CARBON 10%, 1-WATT.....(R30)
- 1-1-MEG. CARBON 10%, 1-WATT.....(R31)
- 1-3300-OHM CARBON 10%, 1-WATT.....(R32)
- 1-4700-OHM CARBON 10%, 1-WATT.....(R33)
- 1-1.5-MEG. CARBON 10%, 1-WATT.....(R36)
- 2-330-OHM CARBON 10%, 1-WATT.....(R37 & R38)

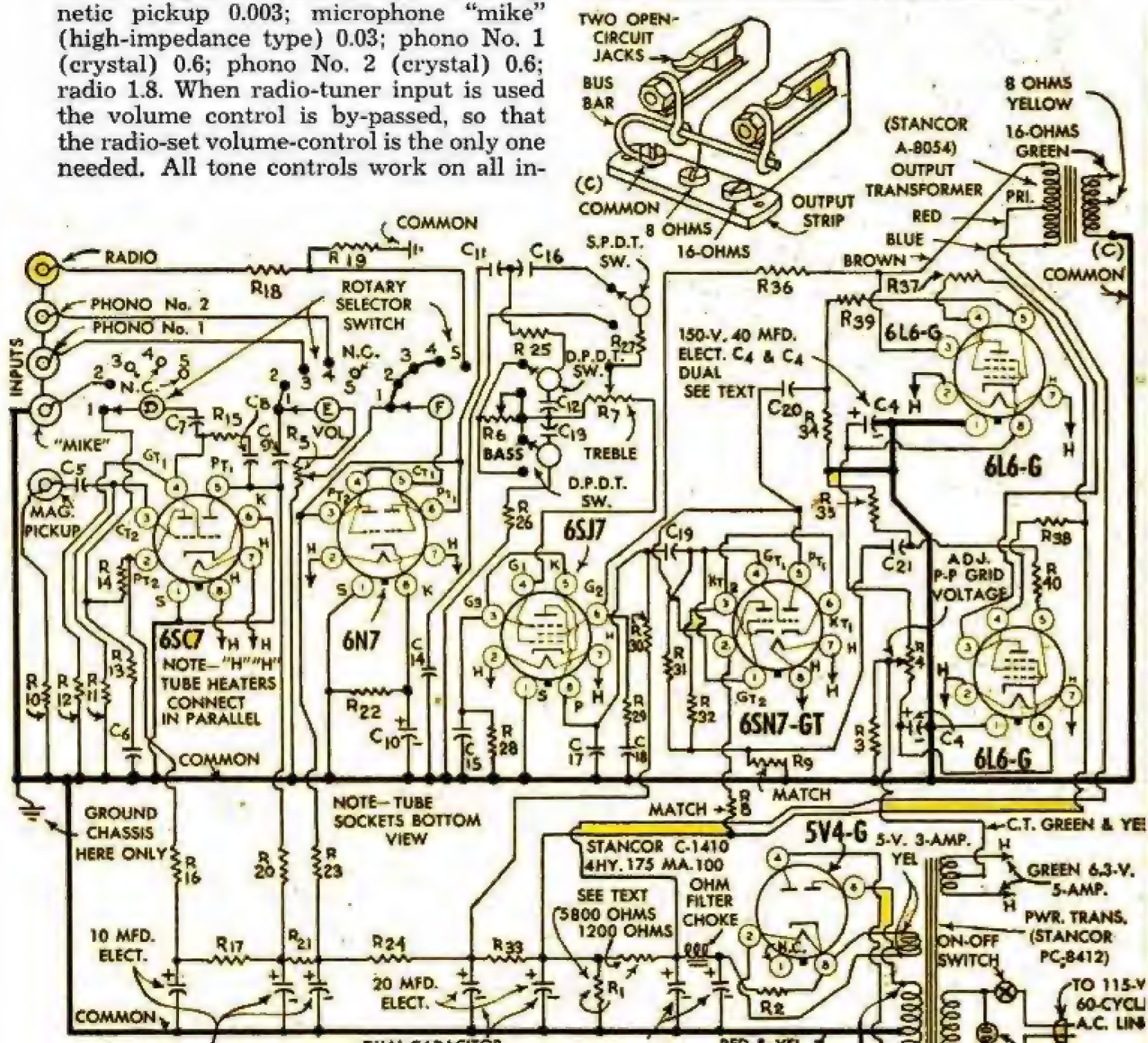
NOTE - K = 1000-OHMS; W.W. = WIRE WOUND



AMPLIFIER HAS LOW DISTORTION ★ ★

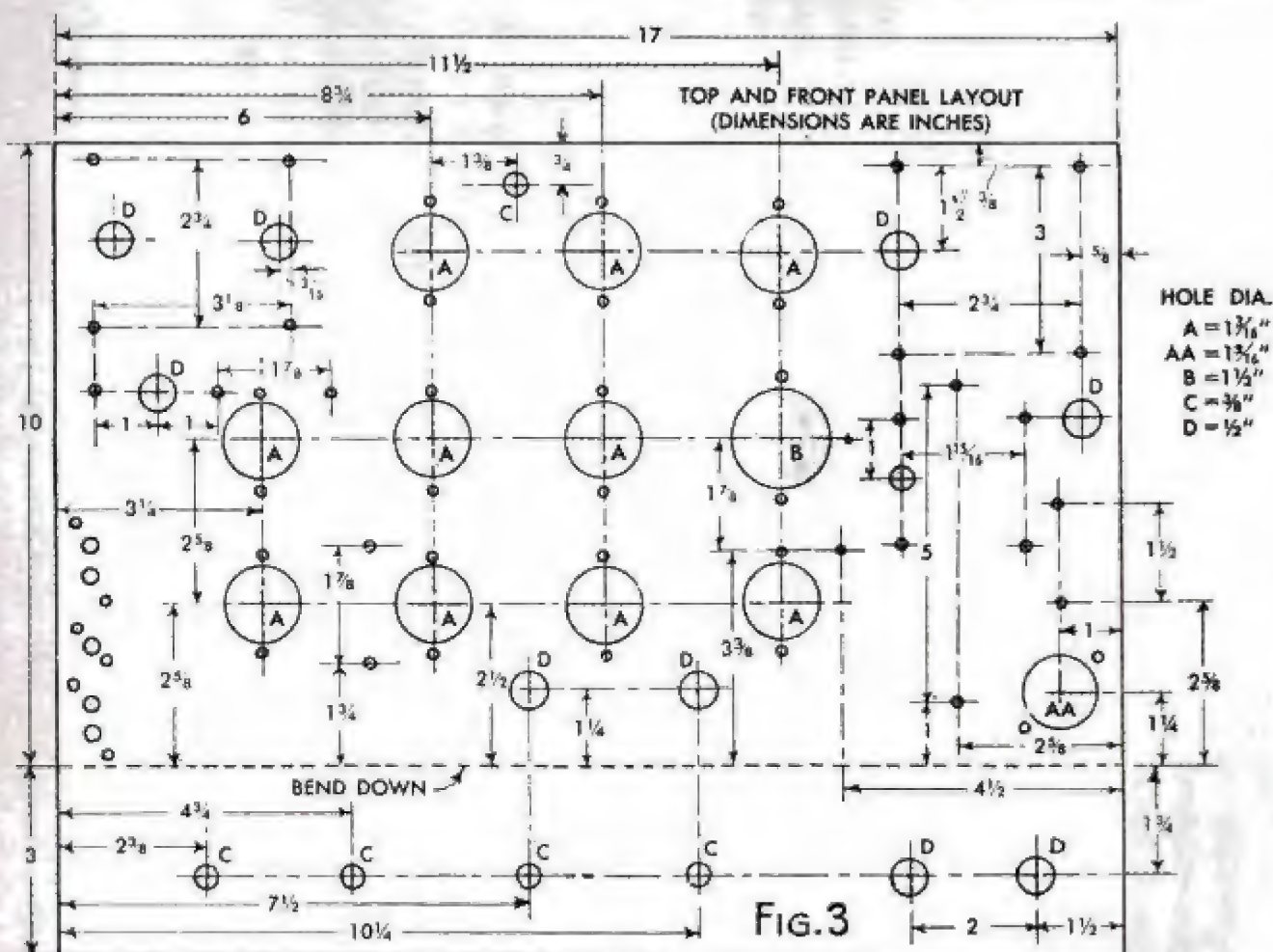
diagram appears in Fig. 2. All resistor and capacitor (condenser) values and specifications are located easily in the charts by means of their R and C key letters and numbers. Schematic circuit diagram Fig. 1 and the pictorial wiring diagram Fig. 2 should both be checked carefully when wiring as one duplicates the other. There are 40 resistors and numerous fixed condensers. Electrolytic condensers C1, C2 and C4 are dual-section types and C3 is a triple-section unit.

Photo C and Fig. 1 show the output jacks for the plugs in case the nested loudspeakers, photo E, previously referred to, are employed. If not, use the screw terminals on the output strip. Five different inputs are available, one at a time, by turning the rotary selector switch. Input volts required for full output are as follows: For the magnetic pickup 0.003; microphone "mike" (high-impedance type) 0.03; phono No. 1 (crystal) 0.6; phono No. 2 (crystal) 0.6; radio 1.8. When radio-tuner input is used the volume control is by-passed, so that the radio-set volume-control is the only one needed. All tone controls work on all in-



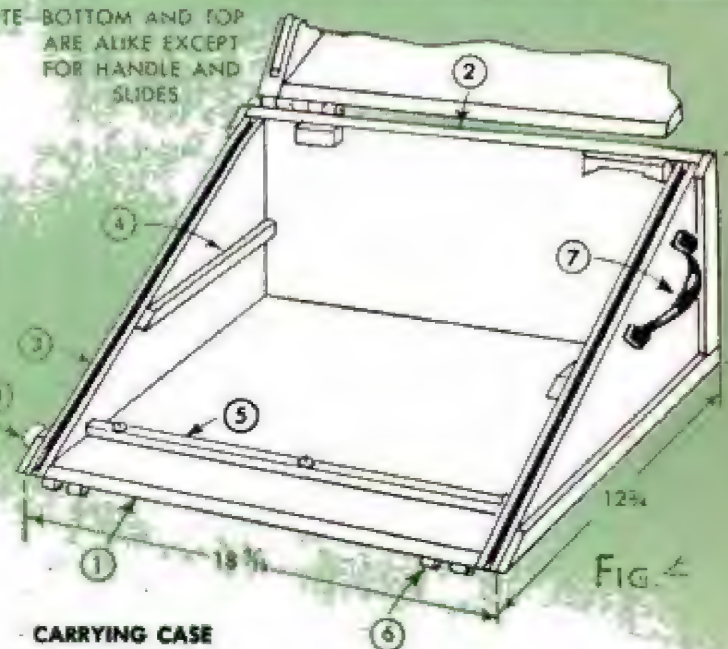
puts. This amplifier has a tremendous range of "bass" and "treble" boost or cut. It is this feature that makes it super-fidelity. At low volume levels the ear loses both the extreme high and deep bass tones. By boosting these, the ear can hear both ends at medium or low volume. Boost or cut is of particular importance with this high-powered amplifier to adjust the output to fit room acoustics or speaker limitations.

(Continued to page 256)



ITEM	REQD.	NAME	SIZE INCHES
1	2	Top & Bottom	¾ X 12¾ X 18 9/16
2	2	Back & Front	¾ X 8¾ X 18 9/16
3	4	Sides	¾ X 8¾ X 12
4	2	Chassis Slides	5/16 X 5/16 X 6
5	1	Chassis Brace	¾ X ¾ X 17
6	2 Pr.	Separable Pin-Butt Hinges	2½
7	1	Handle	
8	8	"Domes of Silence"	

NOTE: BOTTOM AND TOP ARE ALIKE EXCEPT FOR HANDLE AND SLIDES



RADIO and ELECTRONICS TODAY

SPECIAL CONSIDERATION for convenience and adaptability is reflected in some of the new products recently introduced by various manufacturers. The heart of the new-type three-speed record player illustrated in photo A is a novel slip-on 45-r.p.m. spindle which not only replaces the customary inserts now in use but also houses the automatic record-changing mechanism essential to successful operation when the changeover from 78-r.p.m. or 33 $\frac{1}{3}$ -r.p.m. disks is made.

A convenient and compact unit which can be placed in the glove compartment of your car will convert the storage-battery d.c. to a.c. for the operation of a table-model radio as shown in photo B.

A "valet" brush for removing dust from phonograph records is illustrated in photo C. Silent "mike" stenography is now possible with the plastic and rubber facepiece microphone unit shown in photo D. The device is specially designed for court and conference stenographic reporting.

A handy on-off remote-control switch appears in photo E. This extension cord and switch is adaptable to any radio, TV set or other electrical appliance for step-saving remote-control purposes. Photo F shows a tiny clock-radio of advance design for use as a desk set.



brother, you can't go wrong
on these tools."



"Ask any mechanic who *is* a mechanic about Bonney tools. You'll get the straight dope on why they're tops.

Believe me, you get the *best* tools at standard prices. I *know* — I sure check price.

My tool kit is full of Bonney knucklesavers. They have a 'feel' that makes you sure of first class work. That means more dough in the pay envelope.

Another thing! If you're short on cash, take a look at a BONE-CON* tool. They carry the standard Bonney guarantee."

Remember. Your local Bonney jobber, as well as Bonney, stands behind the tools you buy. He has Bonney tools priced to fit your needs as well as your pocketbook.



* The new Bonney
economy-priced line

FIRST

*to meet demands
of today's
high powered engines*

Gives you

QUICK STARTS

DOUBLE LIFE

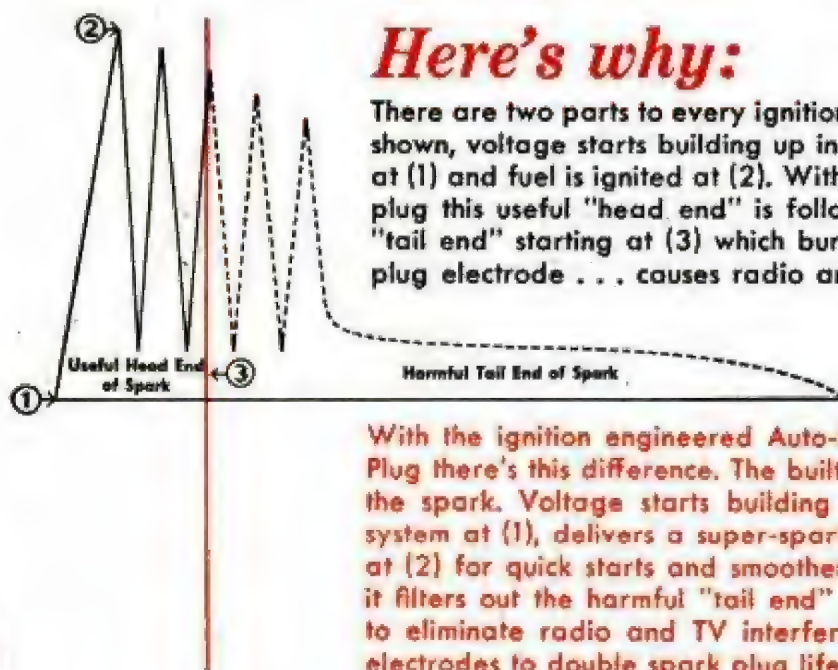
SMOOTHER

PERFORMANCE



**First Resistor-Type Spark Plug APPROVED AS
ORIGINAL EQUIPMENT by leading car manufacturers.**

AUTO-LITE SPARK PLUGS—PATENTED U.S.A.



Here's why:

There are two parts to every ignition spark. In the chart shown, voltage starts building up in the ignition system at (1) and fuel is ignited at (2). With an ordinary spark plug this useful "head end" is followed by a harmful "tail end" starting at (3) which burns away the spark plug electrode . . . causes radio and TV interference.

With the ignition engineered Auto-Lite Resistor Spark Plug there's this difference. The built-in resistor controls the spark. Voltage starts building up in the ignition system at (1), delivers a super-spark to ignite the fuel at (2) for quick starts and smoother performance. But it filters out the harmful "tail end" spark from (3) on to eliminate radio and TV interference . . . protects electrodes to double spark plug life.

Tune in

"SUSPENSE!"

CBS Radio Monday

CBS Television Tuesday

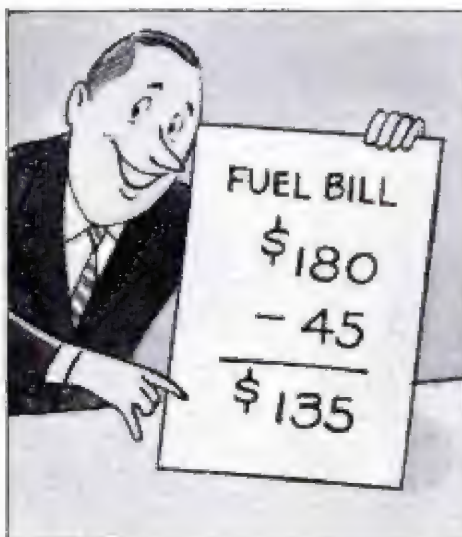
Auto-Lite RESISTOR Spark Plugs are one of a complete line of spark plugs

Let's insulate the attic next Saturday afternoon!

IT'S EASIER THAN YOU THINK—WITH GOLD BOND ROCK WOOL!



Why try to heat all outdoors? You can keep furnace heat in by putting fireproof Gold Bond Rock Wool in your attic. Cooler in summer, too.



Actual tests show insulating the attic can cut fuel bills up to 25%. Savings soon pay the low cost of Gold Bond Rock Wool. All you "spend" is time!



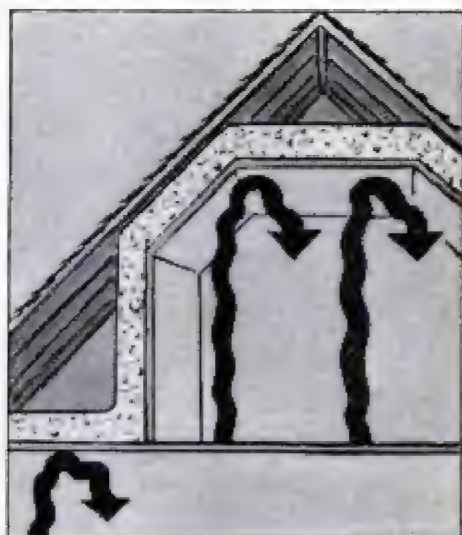
See your Gold Bond lumber and building material dealer. He'll give you printed, easy-to-follow instructions... easy payment terms if you wish.



Start by laying Gold Bond Blankets between floor joists. Blankets come 15", 19" or 23" wide to fit most floors. Keep the "vapor barrier" face down.



If attic already has a floor, you nail or staple blankets to the kneewall and ceiling framing. Your Gold Bond dealer will furnish you a stapler.



Furnace heat stays in, summer heat stays out when Blankets are installed. Gold Bond Rock Wool sticks tight to blanket casing...won't slip or sag!

NATIONAL GYPSUM COMPANY • BUFFALO 2, N. Y.

Fireproof Wallboards, Decorative Insulation Boards, Lath, Plaster, Lime, Sheathing, Masonry Paints, Wall Paints, Textures, Rock Wool Insulation, Metal Lath and Sound Control Products.

ADD-A-ROOM NOW!
with **Gold Bond**

Now you can set up a "darkroom" right in your kitchen

Costs as little as 5 dollars
Takes 5 minutes Worth a million in thrills



So you always thought a darkroom was dark and mysterious, hard to set up and expensive. Well, here's good news. The old-fashioned darkroom has now emerged into the light of day! All you need is (1) a sink and (2) one of the Kodacraft outfits you see here. And when you want to branch out, all you need do is add inexpensive accessories such as you see on the opposite page. Ask your Kodak dealer to demonstrate this equipment.

Kodacraft Printing Kit (displayed above) costs only \$4.95. You can have a world of fun watching your own pictures appear for the first time in a printing tray. And think of the pleasure you can have in making duplicate prints for friends, making greeting cards for special occasions. Use of the Kodak Velite Paper included in the kit permits printing under the lighting conditions of most kitchens or bathrooms. This kit contains the essentials you need for printing pictures—three 5 x 7-inch rocker-type trays, Kodacraft Printing Frame with set of three masks for nine negative sizes, 25 sheets 2½ x 3½ Kodak Velite Paper, graduate, Kodak Tri-Chem Pack, Kodak Darkroom Thermometer, Kodak Glass Stirring Rod, and complete book of instructions.



Kodacraft Photo-Lab Outfit—\$8.75. Includes basic essentials for developing and printing pictures—three 5 x 7-inch rocker trays; Kodacraft Printing Frame with set of three masks for nine popular negative sizes; quick-loading Kodacraft Roll-Film Tank with 620-120, 616-116, and 127 roll-film aprons for easier developing; 25 sheets 2½ x 3½ Kodak Velite Paper; 8-ounce graduate; 2 Kodak Tri-Chem Packs; Kodak Darkroom Thermometer; 2 film clips; and instruction booklet.



Kodacraft Advanced Photo-Lab—\$14.10. Offers complete developing and printing equipment, featuring the easy-to-use Kodacraft Metal Printer for negatives to 4 x 5½ inches. Other items: three 5 x 7-inch rocker trays; Kodacraft Roll-Film Tank with 620-120, 616-116, and 127 roll-film aprons; Brownie Darkroom Lamp, Model B; 25 sheets 2½ x 3½ Kodak Velite Paper; 8-ounce graduate; 2 Kodak Tri-Chem Packs; Kodak Darkroom Thermometer; Kodak Glass Stirring Rod; 2 Kodak Junior Film Clips.



Kodacraft Roll-Film Tank—\$2.53. The easiest tank on the market to load. Includes aprons for 620-120, 616-116, and 127 film.



Kodacraft Miniature Roll-Film Tank—\$2.53. Permits simultaneous development of two rolls of 35mm. film or Bantam-size film (828).



Kodak Blotter Roll—\$2.88. Corrugated backing allows air to circulate and dry prints more rapidly. Keeps prints from curling up.



Spring-wound Kodak Timer—\$7.20. Covers all intervals up to 60 minutes. Both minute and split-second hands. Tilting base.



Kodak Electric Time Control—\$13.50. Automatically times printing. Printer or enlarger plugs into control. Repeat timing possible.

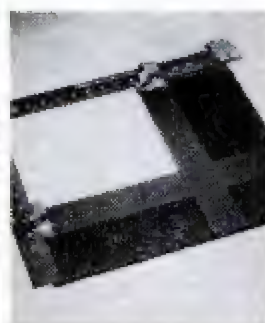
And when you want to expand operations, you have a wide choice of inexpensive Kodak accessories



Kodak Utility Foot-switch—\$10.00. Keeps your hands free. Controls enlarger, printer, or safelight lamp. Dull light marks location.



Kodak Automatic Tray Siphon—\$4.50. Converts sink or tray into automatic washer. Attaches to water tap. Washes prints, films.



Kodak Masking Easel 11 x 14—\$9.60. Facilitates cropping, holds paper flat. Heavy, non-wobble felt base insures steadiness.



Kodak 2-Way Safe-lamp—\$4.50. Its unique construction permits direct or indirect lighting—or both. Safelight filter and bulb supplied.



Kodak Adjustable Safelight Lamp—\$7.40. Has double-sweveled shank and bracket. Attaches to wall, bench. Includes safelight filter.

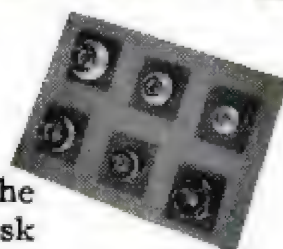


Kodak Hobbyist Enlarger (left)—\$44.00 (incl. lens). Most brilliant enlarger in this price field. The secret is a highly reflective coating inside enlarging head. Cold-light illumination protects negatives. Rotating negative holder loads easily.



Kodak Fluorolite Enlarger (right)—\$99.50 (without lens). Has all the advantages of the "Hobbyist" plus many more uses. With accessories, the 2 1/4" x 3 1/4" "Fluorolite" quickly converts for copying, slide making, other uses. Cold-light protection for negatives.

Kodak Enlarging Lenses (right) for the "Fluorolite" range from the Kodak Enlarging Ektanon Lens, 50mm. f/4.5—\$14.00 . . . to Kodak Enlarging Ektar Lens, 4-inch f/4.5—\$49.90.

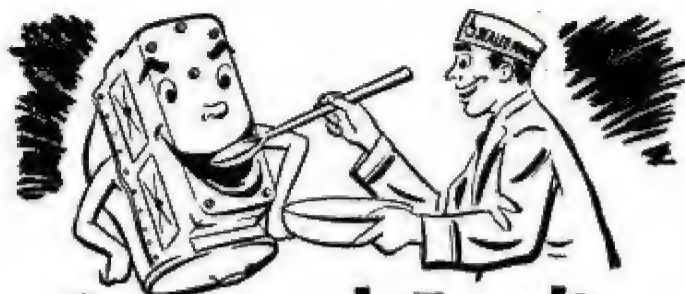


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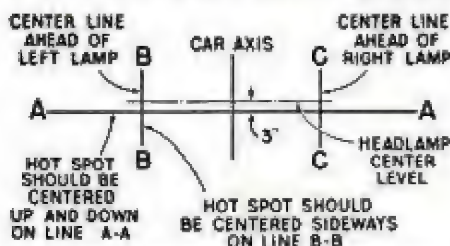
BY S. P. CORP

RADIATOR LEAKS

During cold weather there is a tendency for "permanent" anti-freeze to seep through joints impervious to water. In addition to checking all hose connections and water-pump gaskets before putting in anti-freeze, it is well to check the radiator coolant level often during the winter to make sure seepage is not causing a loss.

HEAD LAMPS AND SAFETY

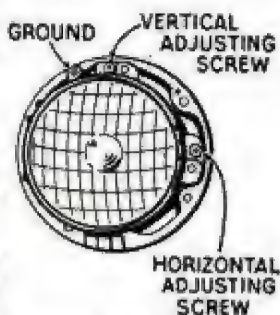
For safe night driving, head lamps should be checked at intervals. Place your car level on the driveway with tire pressure up, no passenger in the car, and lights 25 feet from garage door.



At the same height from the ground as the centers of head lamps, draw the upper horizontal line of this chart. Three inches below this line, draw line AA. Now sight over car hood to mark center of car on garage door, measure distance between centers of head lamps, divide by two, and mark vertical lines BB and CC.

Both lamps should center on the spots where BB and CC cross AA, when "brights" are on. If they don't, remove head lamp rims and use horizontal and vertical adjusting screws to center each lamp while covering the other.

When left lamp centers on BB-AA and right lamp centers on CC-AA, switch to the low beam (dims). Both low beams should be below line AA. If they are not, check lamps for correct installation. The index boss of the lamp may not be fitting into the recess of the lamp body.



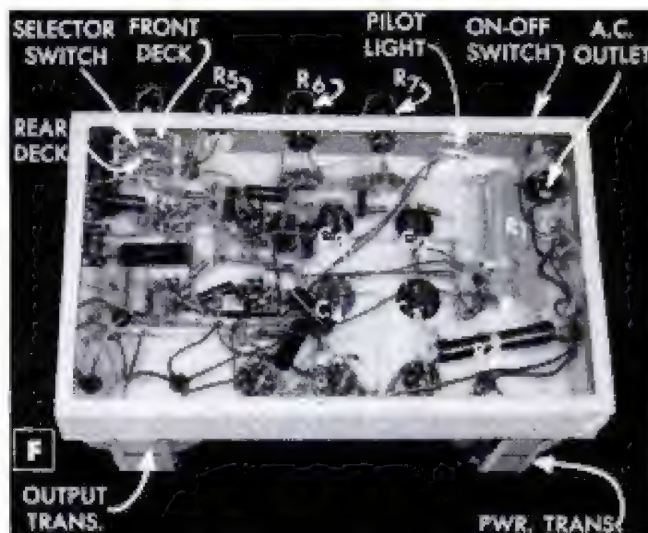
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This new free booklet, "MORE POWER, Less Gas, Less Oil," is yours for the asking. It offers much useful help on car care, and facts on Sealed Power KromeX Ring Sets, which will control oil even in badly tapered or out-of-round cylinders. Address a postal card to Sealed Power Corporation, Dept. G-2, Muskegon, Michigan.

Twenty-Watt Super-Fidelity Audio Amplifier Has Low Distortion

(Continued from page 251)



An a.c. outlet is conveniently placed on the chassis top; this is for supplying power to a phonograph motor or radio tuner when the amplifier is "on."

When mounting the parts on the chassis base, the electrolytic-filter-condenser units C2, C3 and C4 are mounted with their insulating plates under the chassis. C1 is mounted with its plate above the chassis. Make sure that the negative ground lugs on these condenser units do not touch the chassis. The common ground is on the heavy No. 14 bus-bar wire and the single chassis-ground point is indicated. Among the first wires to install is the G1 connection (terminal 4) on the 6SJ7 tube socket to the treble-control potentiometer R7. This wire should lie flat near the chassis to eliminate the need for shielding. Lay the tube heater wires close together to minimize hum fields.

The selector switch comes assembled for 6 positions, 5 operating and one "off." Follow the manufacturer's instructions that come with it to get 5 operating positions and no "off." File a flat on the shaft to make a positive seat for the control knob. Do not cut transformer wires—connect to the proper places and, after testing, bunch the wires and tape them together. The filter choke wires are too long and may be cut to proper length. If you have no ohmmeter to check the slider of the adjustable resistor R1 to 1200 ohms, you can replace resistor R1 with two separate wire-wound, 20-watt resistors of the same values.

When testing the amplifier for the first time make sure that the feedback is right. Put a 100-ohm resistor in series with the loudspeaker and connect to the 8-ohm output terminal. If the feedback is wrong, a

(Continued to page 258)

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squeal will appear when the amplifier has warmed up. Turn "off" and feed resistor R-36 from the other 6L6-G output-tube plate; in other words, directly to socket terminal 3 on the second 6L6-G output tube. When using a voltmeter to set the slider of power resistor R1 to 1200 ohms, move the slider so that, with no audio input, 270 volts appear from one positive terminal of electrolytic condenser C4, to the slider connection on the terminal strip. If you have no voltmeter use two separate 20-watt wire-wound resistors previously mentioned.

Once R4 is balanced for the proper push-pull control-grid voltages, it seldom has to be changed unless the 6L6-G output tubes are changed. If one has to be replaced it is always best to replace both old tubes with new ones. To adjust R4 connect a 5 or 10-volt d.c. voltmeter (1000-ohms per volt) across the plus (positive) terminals of the dual electrolytic condenser C4 and adjust R4 until the voltmeter reads zero.

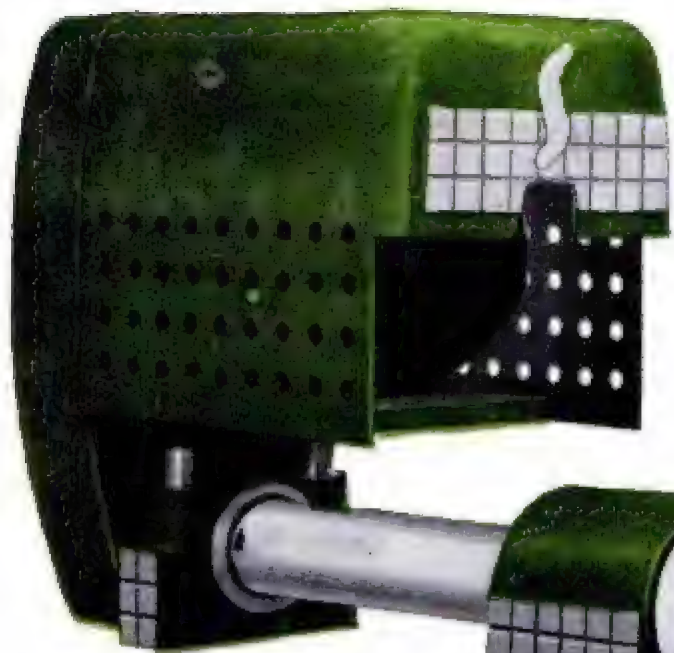


G

Lacking a voltmeter, set potentiometer R4 at its center point, half way from each extreme position. This will give the approximate correct setting.

All the component parts specified are standard radio-catalogue items except the .5 mfd. 400-volt paper-type condenser C18. This value is seldom listed. A paper-type .25 mfd. 400-volt capacitor may be substituted here.

When two or more 8-in. PM loudspeakers are used, the voice coils must be properly phased. Before connecting several to the amplifier, hook them all up in series with a dry cell. As the dry cell is connected, note if speaker cone moves each the same way—in or out. If one moves out when the others move in, reverse the leads on the one which moves out. Detailed student material list R-416 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★



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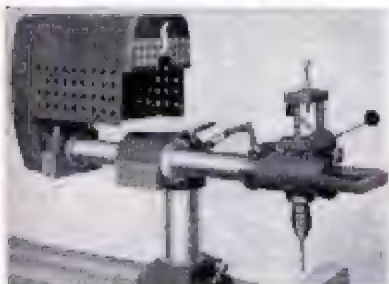
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Eliminating Ink Stains

Q—How does one remove an ink stain from fabric? I'm not certain, but I think the ink I spilled was drawing ink and it seems to defy all efforts at removal. The stain covers only a small area. Is it possible to remove it without damaging the fabric?

E. R., Mass.

A—If you are reasonably sure that you spilled drawing ink, that is, India ink, then try concentrated liquid ammonia. This should be obtainable from your druggist in the small quantity required. First, soak the material in lukewarm water and wring out lightly. Spread over a clean dry cloth. Apply the ammonia solution, a few drops at a time, to the ink spot. After a minute or so, saturate a tuft of cotton in dilute phosphoric acid and apply repeatedly to the spot. Press firmly but do not rub. Then rinse the fabric in warm water and dry in the sun. On some fabrics the application of dilute phosphoric acid will not be necessary as the softened ink can be lifted off with tufts of dry cotton. It is not advisable to use these solutions on fine fabrics or silks. **Caution:** Handle all chemicals with care and destroy any unused portions.

House Plants in North Windows

Q—I have an old-fashioned bay window in my dining room which is on the north side of the house and exposed. Although protected by storm sash during winter, I have found that plants do not do well during the cold winter months. Is this because the temperature is too low on an average, or is it because of the indirect light?—P. B., Iowa

A—Only certain types of plants can be expected to thrive during winter at a north window. Ordinarily ferns, ivies and variegated foliage plants do best in the colder climates. There are others, of course, but these seem to be the most universally successful. They should be started in large pots that provide space for plenty of enriched soil, plus gravel for drainage and aeration and should be watered regularly. On severely cold nights the plants may be protected either by moving them away from the window or by covering the lower half of each sash with heavy cardboard held in place with adhesive tape. On bright, sunny days when the midday temperature is moderate, move the plants close to the window.

Drilling Holes in Plaster

Q—I need to drill several small holes in a plastered wall. I tried several methods but the plaster cracks and chips each time near the hole. How should I do this?—G. B., N. Y.

(Continued to page 264)

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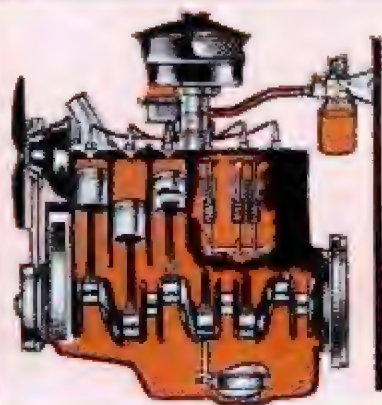


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Front view of the Harley-Davidson Big Twin. Note the massive fork that contains springs for smooth riding

Floyd Clymer Reports on Motorcycles

(Continued from page 94)

80-cubic-inch models of previous years. The small British singles and twins have set

many new motorcycle performance records.

British design has had some effect on domestic models in that the imported cycles are lighter than the large twins built in this country. The Indian Warrior 30.50-cubic-inch model is a vertical twin somewhat along British lines. The small Indian Brave single, even though it bears the Indian name, uses a British engine.

Other United States twins are all of V-design, including the new Indian 80-inch job, the 74-cubic-inch Harley-Davidson O.H.V. and the new Model K Harley-Davidson 45-cubic-inch twin. Noticeable results of foreign competition are such features as the foot gearshift (now used by Harley-Davidson and Indian) and also spring frames and telescopic fork designs. With more makes being built in England, more engineers are working on new designs and some of the results are proving popular with our own riders.

Outstanding British makes sold in this country are BSA and Triumph, both featuring vertical twins of 40-cubic-inch capacity. Other popular British makes include AJS, Ariel, Matchless, Norton, Royal Enfield, Sunbeam, Velocette and Vincent. While a few other British motorcycles are

(Continued to page 282)

Chart of most popular motorcycles in the U.S. listed according to displacements (to nearest c.c. category)

MAKE	COUNTRY	125 cc.	150 cc.	165 cc.	200 cc.	250 cc.	350 cc.	500 cc.	600 cc.	650 cc.	750 cc.	1000 cc.	1250 cc.	— OVER
A. J. S.	ENGLAND						SINGLE	SINGLE & TWIN						
AMBASSADOR	ENGLAND				SINGLE									
ARIEL	ENGLAND						SINGLE	SINGLE & TWIN				4-CYL.		
B. M. W.	GERMANY					SINGLE		TWIN	TWIN					
B. S. A.	ENGLAND	SINGLE				SINGLE	SINGLE	SINGLE & TWIN	SINGLE	TWIN				
C. Z.	CZECH.	SINGLE												
D. K. W.	GERMANY	SINGLE			SINGLE	SINGLE								
DOT	ENGLAND	SINGLE			SINGLE									
DOUGLAS	ENGLAND						TWIN							
EXCELSIOR	ENGLAND	SINGLE			SINGLE	TWIN								
F. - N.	BELGIUM					SINGLE	SINGLE	SINGLE - 450 cc.						
FRANCIS-BARNETT	ENGLAND	SINGLE			SINGLE									
HARLEY-DAVIDSON	U. S. A.			SINGLE							TWIN - 45 cc. in.	TWIN - 74 cc. in.		
HOREX	GERMANY						SINGLE	TWIN						
INDIAN	U. S. A.				SINGLE - 218 cc.			TWIN						TWIN - 80 cc. in.
JAMES	ENGLAND	SINGLE			SINGLE									
JAWA	CZECH.					SINGLE	TWIN	TWIN						
MATCHLESS	ENGLAND						SINGLE	SINGLE & TWIN						
MOTO GUZZI	ITALY	SINGLE - 55 cc.				SINGLE		SINGLE						
MUSTANG	U. S. A.						SINGLE - 318 cc.							
NORTON	ENGLAND						SINGLE	SINGLE & TWIN	SINGLE					
N-S-U	GERMANY	SINGLE - 200 + 185			SINGLE			SINGLE						
PANTHER	ENGLAND					SINGLE	SINGLE		SINGLE					
PUCH	AUSTRIA	SINGLE	SINGLE			SINGLE								
ROYAL ENFIELD	ENGLAND	SINGLE				SINGLE	SINGLE	SINGLE & TWIN			TWIN - 200 cc.			
SAROLEA	BELGIUM	SINGLE					SINGLE - 195 cc. and	SINGLE & TWIN	SINGLE					
SERVI-CYCLE	U. S. A.	SINGLE												
SUNBEAM	ENGLAND							TWIN						
TRIUMPH	ENGLAND		SINGLE					TWIN		TWIN				
VELOCETTE	ENGLAND				TWIN		SINGLE							
VINCENT	ENGLAND							SINGLE				TWIN		
ZUNDAPP	GERMANY				SINGLE				TWIN					

* NEW MODEL DUE SPRING, 1955

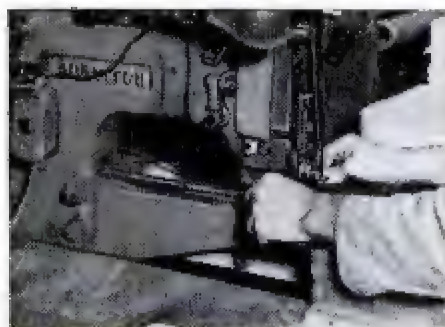
EDITOR'S NOTE: Cylinder displacement of foreign engines is measured in cubic centimeters; of American and some British engines in cubic inches. Here is a convenient conversion table—

- 74 cubic inches equals about 1200 cubic centimeters
- 61 cubic inches equals about 1000 cubic centimeters
- 30.50 cubic inches equals about 500 cubic centimeters
- 21 cubic inches equals about 350 cubic centimeters
- 15 cubic inches equals about 250 cubic centimeters

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(Continued from page 260)

A—The simplest method is to cut the head from a small finishing nail which is slightly smaller than the diameter of the hole required. Hold the pointed end of the nail on an anvil or other metal surface and flatten it slightly with a light hammer blow. Drive this improvised drill with a hand drill, working slowly until the drill point breaks through the finish coat of plaster. Although not essential, a somewhat cleaner hole will be produced if the flattened end of the drill is pointed.

Water Runs Under Front Door

Q—Whenever there is a driving rainstorm, water comes under our front door and spreads over the floor. This condition already has caused considerable damage, and in an effort to prevent this we had a hood installed and also a kind of shield at the bottom made from a molding. Although these installations have helped, they have not cured the trouble entirely. Some water still seeps in. What else can be done?

W. S., Ark.

A—Not much, perhaps, but you might try a carpenter's trick that has proved effective. In your case it may involve rehanging the door, but fortunately, that is less difficult than it sounds. Simply remove the door and move the hinges about $\frac{1}{4}$ in. inward on the jamb. Relocate the striker plate and the stops accordingly. Usually this can be done by cutting the hinge and striker-plate mortises $\frac{1}{4}$ in. wider. Then rehang the door. The purpose of rehanging in this manner is to locate the bottom corner of the door so that it overhangs the bevel of the threshold about $\frac{1}{4}$ in., giving much the same effect as the drip gap on the underside of a window sill. Some types of door-frames have rabbeted jambs which will not permit this change. In this case, take up the old threshold and fit a new one in such a position that the bottom corner of the door overhangs the threshold bevel. Either method is quite effective. On new installations it probably will be easier to replace the threshold than to rehang the door. Where equipment is available, it also is possible to cut a $\frac{1}{4}$ x $\frac{1}{4}$ -in. groove along the bottom of the door near the outer corner.



Removing Enamel From Wall

Q—It happens that I want to remove enamel from one wall of my bathroom. I tried a paint remover but this seemed unsatisfactory as it sagged and ran down the wall without removing the enamel. I've been told that I can use lacquer thinner, but how does one apply it?

O. E., Calif.

A—Don't use lacquer thinner. It is highly volatile, toxic in a closed room, and the fire hazard when used under uncontrolled conditions is equal to, or even greater than gasoline. Use rather a paint remover of the nonflammable paste type. This comes as a fairly heavy paste and is applied to the wall with a wide putty knife. Care should be taken that the material is applied to the surface in a uniform coating, as otherwise the results may not be entirely satisfactory. Leave the coating on the wall from 3 to 5 hours, then scrape it off. Both paint and remover should then come off cleanly, clear down to the plaster. While the remover is on the wall, adequate ventilation should be provided. Be careful to avoid spilling the remover.





Texaco Tips

on car care

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Titanium—the "Tough Guy" of the Lightweights

(Continued from page 162)

again under an argon atmosphere to prevent contamination from the air. Even so, the titanium picks up some carbon from the furnace lining. One way that this is being prevented is to use a water-cooled copper lining in the furnace. The lining remains so cold that the titanium freezes a skin of itself on the cold mold and in effect becomes completely molten in a crucible made of itself.

Production of titanium amounted to 75 tons in 1950, jumped to 500 tons in 1951, to 1000 tons in 1952 and plants now under construction will boost the annual figure to 7000 tons by early 1954. The target is 22,000 tons a year by 1956. Costs will not come down a great deal, however, because the Kroll process and all its variations are complicated and expensive. Ingots of up to a half ton and even one ton are being produced but production is still on a batch basis.

One of the production problems concerns the heat that is generated by chemical reaction when magnesium combines with the chlorine. Metallurgists don't gain an advantage when they produce titanium sponge in large batches because the extra heat that is generated requires longer cooling times.

Some kind of continuous electrolytic process is being sought with the hope that this would bring costs down and multiply production at the same time. A number of steel companies and others in the titanium picture are trying to develop such a process as this.

The Bureau of Mines, too, is continuing its research. One type of continuous liquid-phase process was tried without success at its Boulder City, Nev., laboratory. Now facilities are being constructed to try the same idea all over again on a much larger scale. There are several refining processes for other metals that work only on a large-scale basis and there's a chance that this may prove true with titanium.

Meanwhile the concerns that need titanium most are rushing research on how they can best use it. O. A. Wheelon, production-design engineer of Douglas Aircraft, has just perfected a revolutionary hydraulic press, one tenth the size and weight of the tremendous presses now used, that seems especially adaptable to the hot-forming of titanium sheets into complex shapes. The Wheelon press exerts pressures up to 10,000 pounds per square inch, more than three times the pressures

(Continued to page 272)



1 Douglas Fir Plywood . . . Available in various thicknesses from $\frac{1}{4}$ " to $1\frac{1}{4}$ ", you can use different interior and exterior grades of this low-cost Weldwood product to add value and convenience to all parts of your home. It is light, extraordinarily strong, and is easy to saw. It takes nails and screws close to the panel edge without splitting. Use it for roof and wall sheathing, siding, cabinet doors, furniture, counters, fixtures, built-in conveniences, interior paneling, sub-flooring, underlayments.



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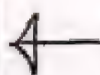
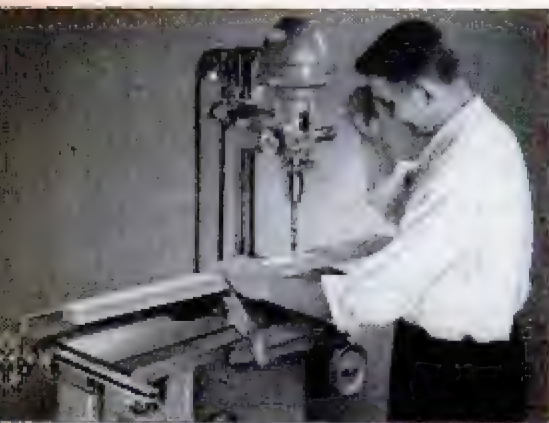
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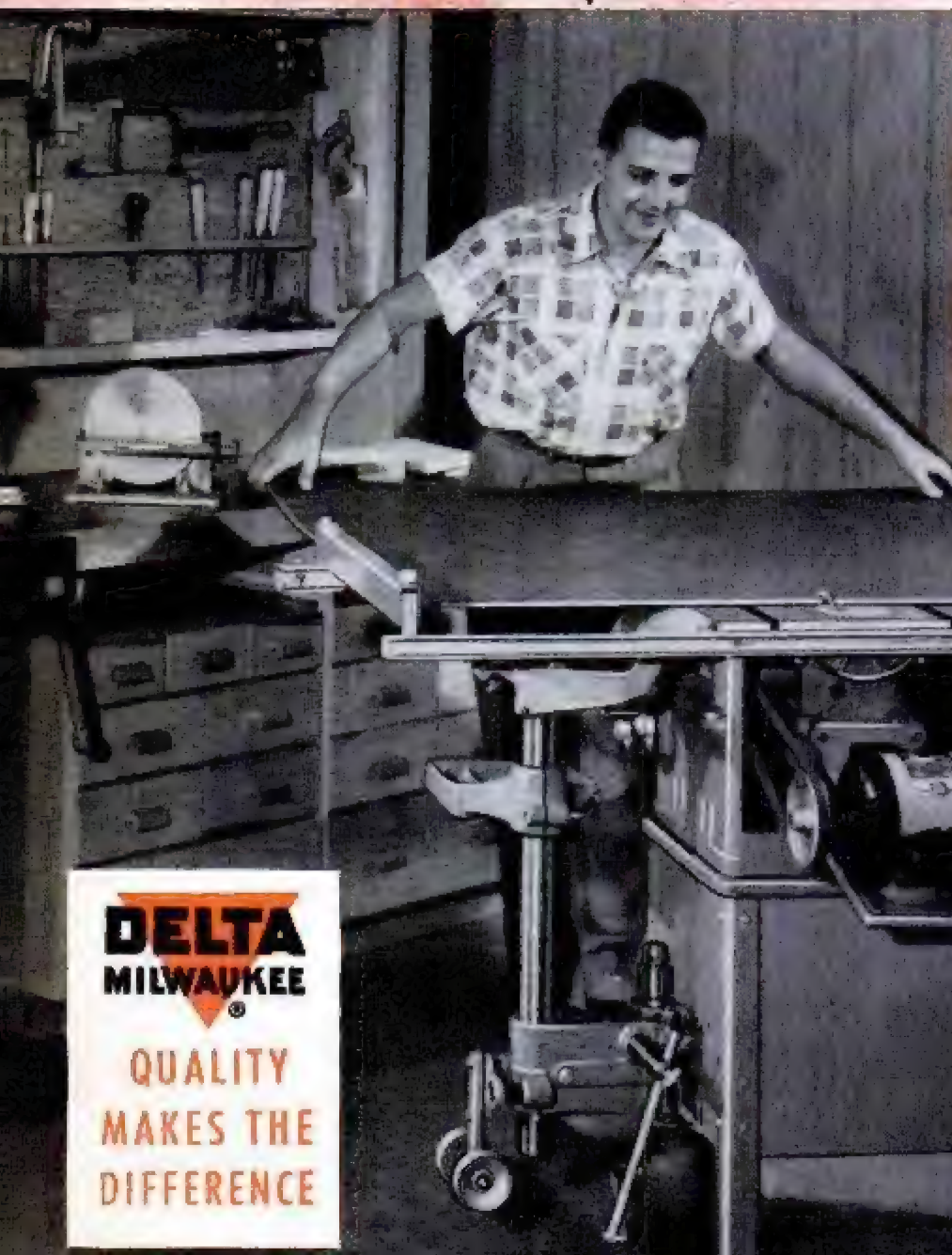
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Before you start work on those bookshelves, built-ins, hallways, bunk bedrooms, breakfast nooks, or basement dens, send for your **FREE** copy of "Enchanting Homes of Western Pines." Write to WESTERN PINE ASSOCIATION, Dept. 276-N, Yeon Bldg., Portland 4, Oregon.

These are the Western Pines

•IDAHO WHITE PINE
•PONDEROSA PINE
•SUGAR PINE

Diving 45 Fathoms for Pearl

(Continued from page 156)

chambers among the pearling fleets and the only method which can be used is to lower a diver back to the depth at which he first was overcome by paralysis. A world's record was made on Torres Strait in 1928, when a Badu islander was staged continuously for 72 hours at a depth of 35 fathoms. It is the longest time a man has been kept below the sea without food or water.

Byro Samuels, a 39-year-old stern diver for the lugger *Phynea*, has set new records for pearl-shell production for the past three years with an average "take" of 28 tons between March and December.

"On one occasion," Samuels said, "we were diving in 25 fathoms when a cyclone hit Thursday Island. The *Phynea* was working off Friday Island five miles away. Seas began to rise rapidly and I could feel my life line jumping as the *Phynea* started to ride the big waves. Myself and two other diver were below.

"We did not panic; our tenders faced with the danger started to stage us to the surface as quickly as they could.

"As the *Phynea* rose and fell I swayed about on the end of my life line like a pendulum. Fearing for all our lives, I signaled to be brought straight up. As I reached the surface my life line fouled the propeller, but one of the crew, Freddie Moses, dived overboard and in a swirling sea cut my life line clear.

"This heroic act saved all our lives, for while I was below the engines could not be started, but once my gear was clear of the propellers I steamed into the sea until the other two men were safely aboard."

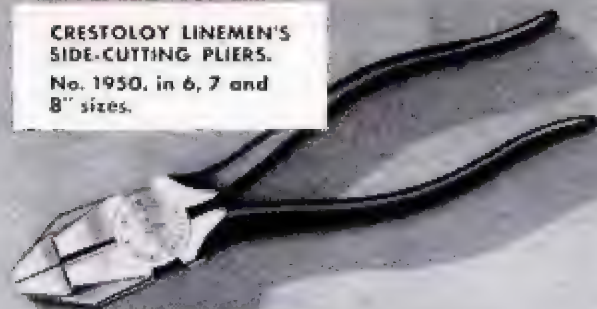
Of all undersea life, according to Samuels, sea snakes and jellyfish are the most feared. Among the jellyfish will be found the sea wasp, or medusa, which is lethal and will kill within 20 minutes once its tentacles have injected their poison. There is no antidote for the venom which has killed more than 20 pearl divers.

A world's diving record of 538 feet, or nearly 90 fathoms, was set by Petty Officer Bollard at Scotland in 1951. Bollard wore a standard diving suit. When Bollard got to 538 feet he was only on the sea bed for five minutes, but it took seven hours to get him to the surface.

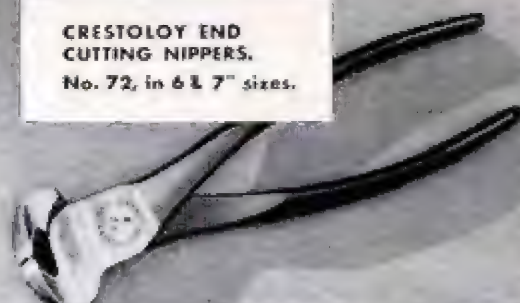
Pearl divers eat little for breakfast or lunch, because a full stomach creates cramps or paralysis when working deep.

Sometimes they are under the sea for hours, other times for 10 minutes, but their submerged period depends entirely upon their luck in striking a well-populated pearl-shell bed. ★ ★ ★

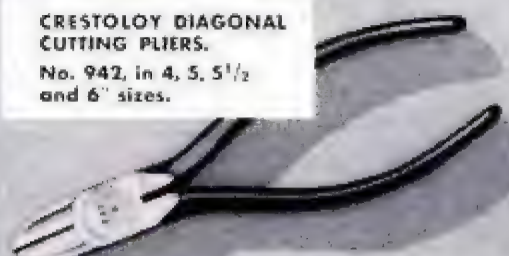
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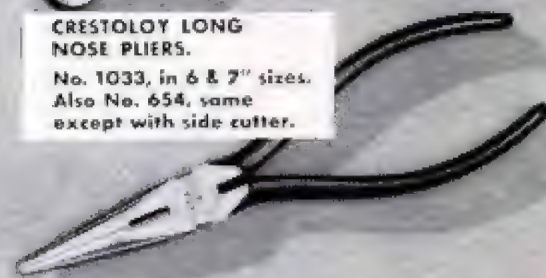
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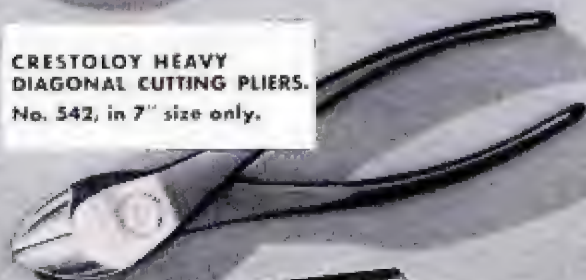
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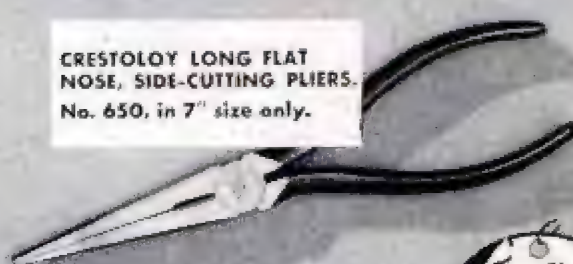
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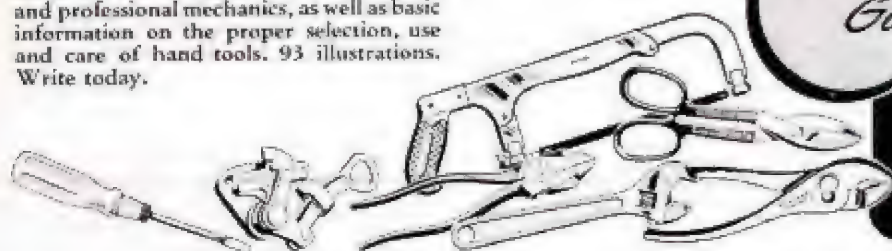
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Standard 1/2" square drive - wide variety of attachments



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The Mark of Superiority

normally used with present equipment. Douglas reports that it will use titanium sheets for about 88 percent of the skin surface on the new DC-7 transport engine nacelles — making a weight reduction of 200 pounds.

North American is using token amounts of titanium in its F-86 fighter planes and is experimenting with cold-forming techniques, using waxlike lubricants to help force titanium sheets into desired bends. Lockheed, Boeing and all the other major aircraft companies are testing samples of the metal and are using small amounts in production.

Three quarters of all the titanium being produced today is going into the manufacture of compressor rings and blades for jet engines. It is being used also for heat-shielding around jet engines and tail pipes and for the fire walls of engine nacelles. Eventually titanium and some of its alloys may be used for major portions of fuselage frames and even for the outer skin of aircraft bodies and wing surfaces.

But it won't be used simply because it's available. In each new application it will have to compete with other metals. There are more than 50 different metals and alloys in the F-86 airframe alone, for instance, each chosen for a special use on the basis of its strength, weight, workability, cost and other factors. And some of these other metals are being vastly improved. The newest aluminum alloy is 20 percent stronger than the best aluminum alloys that have been in common use, which in turn are much stronger than earlier alloys.

A new heat-treatable stainless steel can now be worked while relatively soft and then treated to give it extreme hardness. And steels are being given ceramic coatings, 1/1000 inch thick, that materially improve their resistance to heat and oxidation. Even magnesium is better than it used to be. A new alloy with lithium is much easier to machine than were previous magnesium alloys.

These metals, however, are relatively "old" and most of their possibilities already have been investigated. Engineers doubt that any of them can be improved much more by additional alloying, heat or cold treating, or other processing.

On the other hand, research on titanium has hardly begun. It's a new metal that within a few years may become cheap, abundant and extremely useful. ★ ★ ★

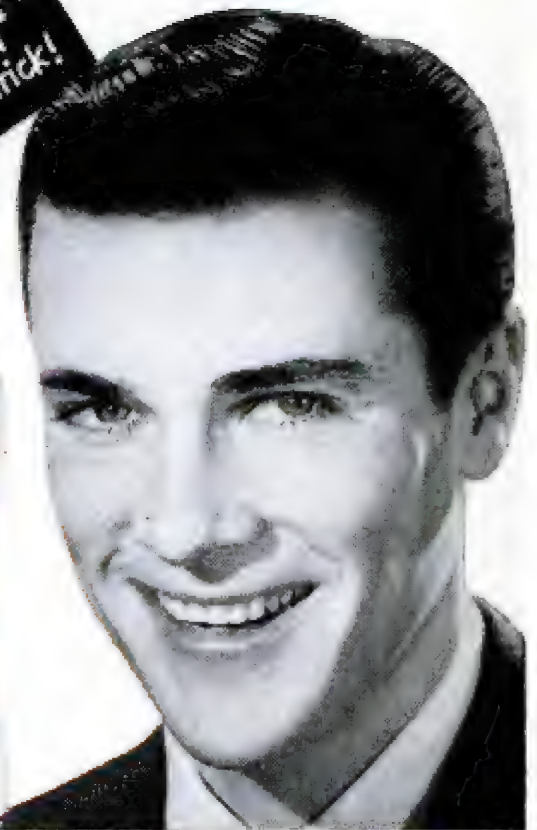
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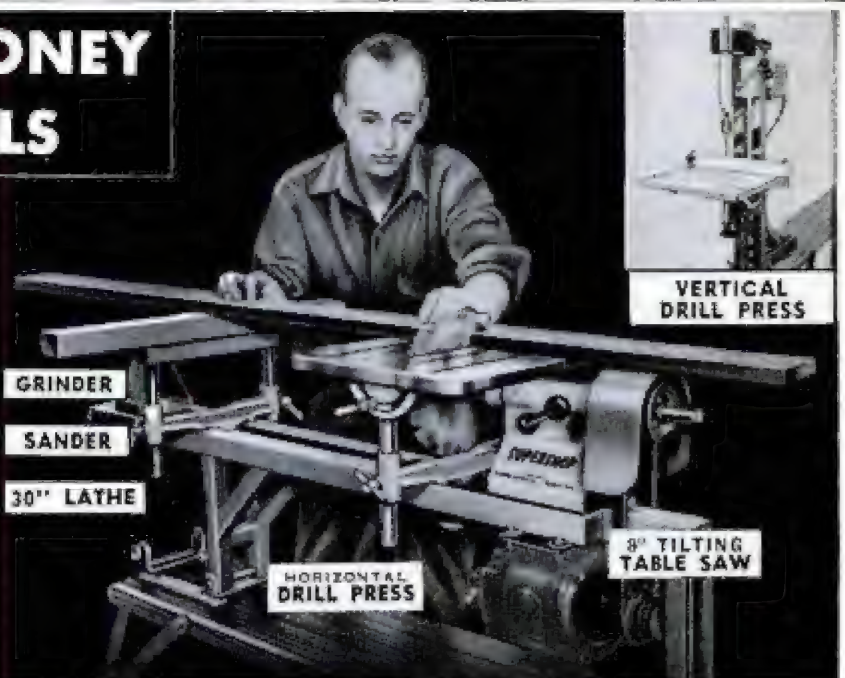
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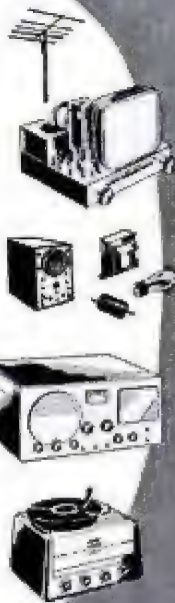


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Bad-Man's Ghost Town

(Continued from page 182)

close supervision of the range officer. This way costs are kept to a minimum.

The pistol-handling and shooting course begins with the officer learning the capabilities of his weapon and how to get the most out of it. When the officer completes his training he is skilled in the use of the pistol, the riot gun, the rifle and the sub-machine gun.

The best marksmen produced by the program give regular exhibitions in shooting, with the pistol as their forte. They perform such stunts as splitting playing cards, shooting pennies, hitting swinging and moving targets, shooting the spots out of playing cards, breaking exceedingly small wafer-like targets while holding their pistol upside down in their hand, aiming by using a mirror and other self-imposed handicaps to good marksmanship.

The high light of any shooting exhibition and training program is the duel-shooting contest where men match their gun speed and marksmanship against each other.

The climax of the pistol-shooting program, either for the officer going through the course, or an observer, is the trip through Hogan's Alley. This replica of one of the streets in the crime district is electrically wired and gadgeted to offer surprise targets to the gunman enforcing the law.

The objective of this training is to make the Phoenix police officer a good man to have on your side. ★ ★ ★

Folding Steel Legs



Sturdy tables can be constructed in 30 minutes' time by using sets of folding steel legs which are attached to the new table top with wood screws. The legs lock into place when in use, stand 30 inches high and support up to 1000 pounds. Only tool needed for assembly is a screwdriver. A flush-type door makes an ideal table top.

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MODEL **K**

for amazing speed,
breathtaking thrills,
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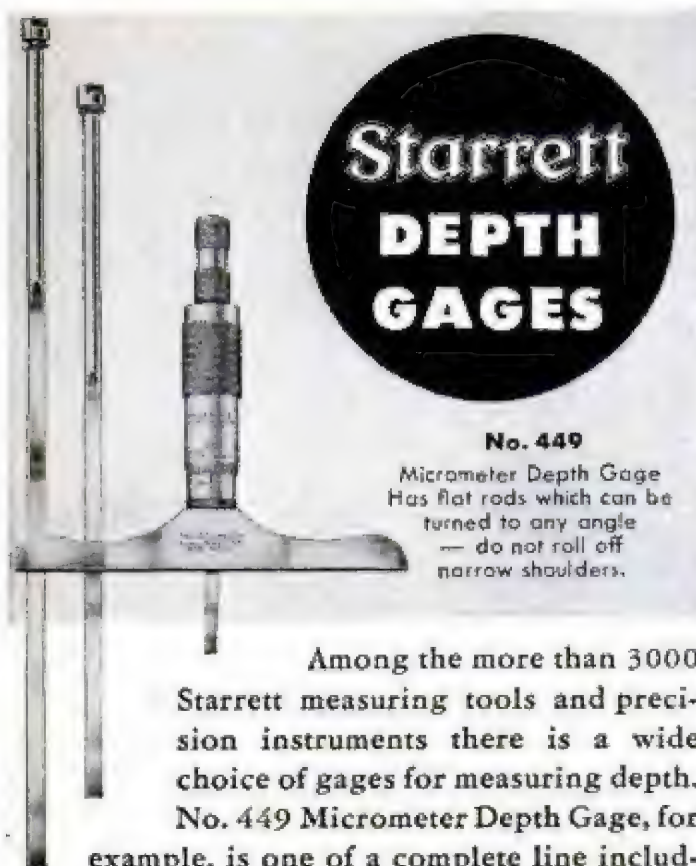


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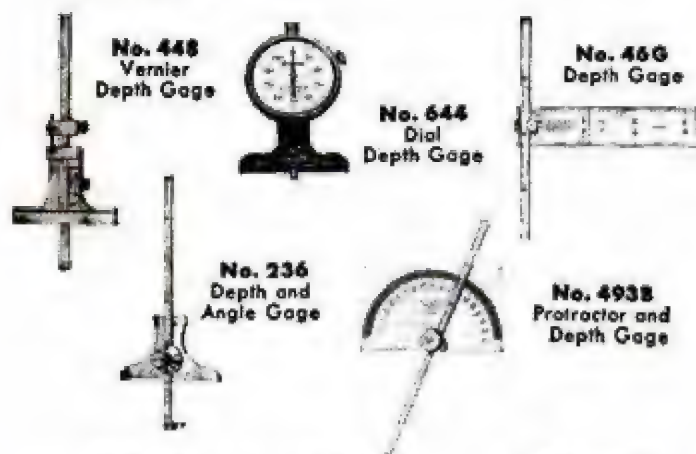
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Has flat rods which can be
turned to any angle
— do not roll off
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"Whirly Bird" Pilots Go to School

(Continued from page 168)

to learn that we flew around turns without loss of speed, and that we didn't land the skid-equipped Bell H-13 like a P-51. You come in and land like a bird instead of rolling several hundred feet."

This preliminary phase of the school is divided between practicing basic flying maneuvers in the Sikorsky H-5 and attending ground instruction. Tedious hours are devoted to orientation, history of the copter and its theory of flight, taught by Walter M. Morris, research specialist from Edgartown, Mass. Weather, navigation, instrument flying and other flight-related subjects—information which has been learned in earlier schools—must be retaught as it applies to the helicopter.

The students learn the meaning and use of the antitorque rotor on the tail (a counteracting force for the reaction of the copter to the main rotor blades), and the difference between collective and cyclic pitch, the horizontal direction and vertical-flight controls.

They spend hours forcing the plane into autorotations for emergency landings, their only means of safety and survival in event of power failure. With a free-wheeling unit which automatically goes into operation when the main rotor blades turn faster than the engine—as in a power failure—the students let the copter rotate downward in a direction opposite to the turning blades. As they near the ground, the fall is cushioned by increased pitch of the rotor blades, or the amount of air the blades bite as they make their sweep through the air, and the craft settles for a landing. Properly executed, a touch down via this route is no more difficult than with power.

For a bit of variation, the instructors throw in hovering practice, the most difficult phase of training. Here, the pilot learns to fly at zero speed several feet above the ground, to change his location, and to repeat the performance. It's a hard way to learn about coordination and mind over matter, but much of his rescue success will depend upon his ability to "stand still off the ground."

"Take the hovering training from the program, and most of the student problems would be solved," said one instructor. "Although all students have the required previous flying experience in air judgment and perception, there is no similarity here to fixed-wing flying. Students must learn separate and coordinated use of all controls in this phase more than in any other."

(Continued to page 278)

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See Why **CRAFTSMAN** Drill Presses Give You Most for Your Money!

Only CRAFTSMAN offers you ALL these features at so low a price!

Drill to the center of a 15-inch circle; 4-inch spindle travel. "Floating Drive" spindle assembly . . . spindle "floats" within the pulley. Four sets of heavy duty, precision ball bearings lubricated for life.

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One-piece pulley and bearing sleeve reduces spindle torque and increases accuracy. It's safer, too, because the splines at top of spindle are enclosed.

10x10-inch ground cast semi-steel table tilts 0 to 90 degrees left or right . . . slotted to hold fixtures.

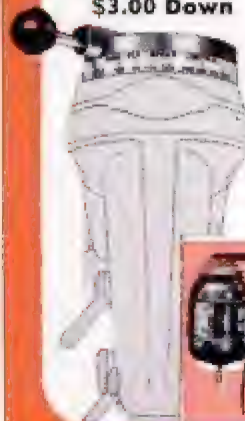
Nine speeds, 610 to 5000 R.P.M. using two matched 5-inch 4-step cone pulleys with a 1/2-inch V-belt (included).

Make your own comparison . . . come in and see these CRAFTSMAN Drill Presses at your Sears Retail Store today.

CRAFTSMAN Vari-Slo Speed Control

\$2750*
Cash
\$3.00 Down

Gives you a 12 to 1 ratio with just one hand lever, without changing belts. You can drill 1/2-inch holes in steel, and increase RPM to routing and shaping speeds in seconds! Select any speed from 300 to 3750 RPM without stopping spindle. Just slide hand lever and lock it at desired speed. No holes to drill or tap . . . easily installed on drill press column. Made of aluminum alloy and cast Tenzaloy. Steel parts plated to resist rust. With 3 CRAFTSMAN V-belts, set screw wrench, and instructions. For CRAFTSMAN Drill Presses on this page. \$27.50*



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Equipped with new-type Jacobs Safe-Lock chuck can't fly off

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MOTOR RECONDITIONER KIT

1-2 combination that cleans and reconditions your engine. Increases compression, eliminates piston slap, and reduces oil consumption.

Double Valve Kit Contains

P. V. R. COMPOUND — when poured in carburetor, P. V. R. cleans your engine of gum, carbon and varnish. Frees rings, valves and pistons. Prepares your engine for...

RING-RE-NU — the amazing compound which when squeezed by tube on your pistons forms a pliable, self expanding lubricating seal on rings and pistons to compensate for wear. Good for 10,000 plus miles. Saves overhaul cost and oil bills.

Simple to Install —

Nothing to dismantle. Will take you only a few minutes with our easy-to-follow instructions.

Order the Genuine **RING-RE-NU** — not a foreign import. Made in America for American engineered engines. Guaranteed not to harm your engine. Assures you of 10,000 plus miles of "new car" performance.



1 tube kit — good for all makes of cars (except those listed below) only

\$4.95

POSTPAID

Copr. 1959
R. D., Inc.

2 tube kit — for larger engines — Buick Roadmaster, Cadillac, Chrysler 8, LaSalle, Lincoln, Packard 8, Olds 88 and 98 — \$8.95 postpaid.

(\$1.00 deposit required on all C.O.D. orders)

10 DAY MONEY BACK GUARANTEE

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SAY YOU SAW IT IN POPULAR MECHANICS

HOW MANY TOOLS DOES A HANDYMAN NEED?

HERE'S A
WHOLE
TOOL KIT
IN
**ONE
TOOL!**



No. 10-W
\$2.60

VISE-GRIP
WRENCH

You need fewer tools, get far more done, when you use a Vise-Grip Wrench! Locks to any size work with Ton-Grip. Won't slip! Turns, twists, pulls, bends, holds, ratchets, cuts. A Super-Pliers, Locking Wrench, Toggle Press, and many more — in 1 trim tool! 7" and 10", only \$1.85 to \$2.60, at your dealer.

Manufactured Only By

PETERSEN MFG. CO., Dept. M-2, DeWitt, Nebr.

Preliminary training of the Army Field Force students parallels that of the Air Force school. The Army students, however, receive some additional precision training needed to qualify them as rotary-wing pilots capable of darting forward, backward, sideways, or up and down in the light Bell H-13 and Hiller H-23 models. They also have to hover above the ground almost as capably as a bee hovers above a flower.

Midway in the Air Force's advance phase the student begins to wonder if he's to be a pilot, a mechanic or a new needle-pusher for the hospital detachment. Maintaining his daily operational flight training in the heavy Sikorsky H-5, the student spends more time in the mechanical shops and first-aid classes than he does in the air.

He learns to dismantle and rebuild his eggbeater should he be downed in dangerous territory. There, he'll be the only person around to do the repair job needed before he can fly out his patient. In the first-aid classes, he learns how to use the hypodermic needle on his fellow students, using glucose rather than plasma and shock medicines. At the end of the 20 hours of first-aid training, he can recognize and give emergency treatment for most situations he will encounter in his future search and rescue operations.

The closing hours of the course are spent in weight-distribution studies of the craft and learning to make like a hummingbird in the Air Force's helicopter giant, the Sikorsky H-19. This giant single-rotor helicopter—which has a capacity of 10 passengers, six litters or a ton of cargo, plus a pilot and copilot—is the craft he will use in search-and-rescue operations after graduation, more than likely under enemy fire in Korea. Under full load, he must be able to dart vertically, horizontally, or at any angle with the greatest of ease.

Under all flying conditions, he learns about the giant, which was made famous in Korea. He learns its use in air-evacuation techniques and the importance of the electric hoist, used when the craft is unable to land and must hover above the ground during the rescue.

Tension begins to mount toward the end of the 10-week course, with the student afraid he will lack full coordination required of the helicopter pilot.

During the two and a half months at San Marcos, the student has learned more intimate things about the helicopter than he cared about learning of the conventional craft he previously piloted. And the more intimate he's able to get with his new aerial eggbeater, the more he will argue that he's the Air Force's busiest pilot, flying the war's craziest contraption." ★ ★ ★

THIS ALADDIN 5-ROOM HOUSE



\$1974

FREIGHT PAID

Slightly Higher West of Missouri River

YOU CAN BUILD THIS ALADDIN READI-CUT HOUSE YOURSELF...and Save Hundreds of Dollars!

Imagine receiving A COMPLETE HOUSE IN ONE SHIPMENT—ready to erect! You get everything needed. The lumber is the finest—every piece THOROUGHLY DRY. And it comes to you the EXACT SIZE needed—cut at the mill by fast, precision machines. No stopping to measure and saw each piece! (You save as much as 30% on

labor—18% on waste) and YOU CAN CHOOSE FROM 99 INDIVIDUAL PLANS—beautiful, modern houses of all sizes and styles. Not only will you save money but you will have the satisfaction of knowing that Aladdin Houses have withstood the test of time during the past 46 years. Aladdin's thousands of satisfied customers are your guarantee of honest value.

BEAT THE HIGH BUILDING COSTS!



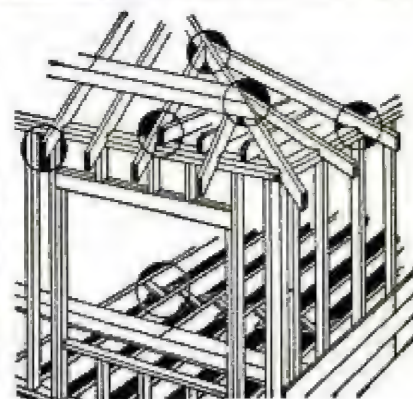
With carpenters getting up to \$24 a day think how much you can save by building your own Aladdin house!

Carpentry work runs from 300 to 1200 hours, depending on the house you choose. Even if you hire help you save because most of the expensive, time-consuming labor (measuring and cutting) has been done by machine at the mill. No wonder Aladdin houses are so easy to build—and at a cost



WHAT READI-CUT MEANS

The picture at the right shows how each piece of Aladdin lumber is cut to EXACT size at the mill—mitred and bevelled for perfect fit. Aladdin houses are designed to meet the most exacting building standards in both construction and materials.



that often compares favorably WITH PRE-WAR COSTS! Drawings and instructions are simple to follow and cover everything from the foundation up. More than half the Aladdin houses sold have been erected by the buyers themselves!



WHAT YOU GET WHEN YOU BUY AN ALADDIN HOUSE

- ALL THE LUMBER accurately cut to fit, marked and numbered ready to erect practically without use of a saw.
- SIDING • HARDWARE • MILLWORK • GLASS
- FLOORING • PAINT • MOULDINGS • ROOFING
- DOORS • TRIM • WINDOWS • NAILS
- COMPLETE DRAWINGS & INSTRUCTIONS

IMMEDIATE DELIVERY

**GOOD HOUSES NEVER GROW OLD —
ALADDIN HOUSES ARE NOT PREFABRICATED**



THE ALADDIN CO.
BAY CITY, MICHIGAN

Est.
47
Years





YOUR LIFE MAY DEPEND ON USING THE RIGHT BRAKE FLUID

Just keeping enough fluid in the brake system is NOT the answer if you want good brakes . . . and SAFETY!

There are many brake fluids which can be dangerous . . . some, freezing point too high or boiling point too low . . . no water absorption . . . no rust protection . . . no lubricating qualities . . . ingredients which cause distortion of rubber parts and formation of sticky gums . . . and . . . some that won't properly mix with fluid presently in brake system.

Don't Take Chances . . . INSIST ON

BOWES BRAKE FLUID



Certified to meet or exceed
SAE Specifications

**IF YOU WANT TO STOP IN TIME...
SEE YOUR BOWES DEALER
FOR SAFE
BRAKE FLUID!**

BOWES "SEAL FAST" CORP., INDIANAPOLIS 7, IND.

He Bosses 11,000 Acres by Radio

(Continued from page 176)

hoist on a wrecker truck. Traffic is not congested on the farm and wrecks are unlikely. But there is mud, and lots of it. Most of the roads are just plain dirt and sprinkler overflow frequently traps a vehicle. The driver radios for the A-frame and gets it in a matter of minutes—if somebody five miles across the farm hasn't already called for it.

One foggy morning, a radio-equipped Camp pickup was moving down the highway from Rupert. The driver slammed on his brakes and pulled to a stop. In a ditch beside the road were two cars that had collided head-on. Three of the occupants were badly injured. The Camp driver barked into his speaker, and Mrs. Anderson had an ambulance and police car screaming to the scene seconds later.

Oddly enough, it isn't the radio system, the air operations or the vast size of the project that most intrigues the native farmers. It's the way the Camps farm. There's that matter of not turning the soil with a plow, of course.

"But do you know what else they're doing?" one farmer asks. "They're seeding their potatoes in rows 32 inches apart."

In Idaho's famed potato land that's almost heresy. Generally the rows are 36 to 38 inches apart. Farm manager Kerbs has the answer. "We don't grow such big potatoes that way," he says, "but we grow more of them, and the quality is better."

Kerbs himself is a native Idahoan, who used to farm 95 irrigated acres of his own. When he started farming he used horses. There's not one of the animals on the Camp farm today.

"The other day, though," he says, "we had to cut a small drainage ditch. The field was too wet for a tractor, so we borrowed a team of horses. They looked odd out there on that big patch of land—but kind of good."

★ ★ ★

Supersonic Transport Planes Are Years Away, Says Expert

Speeds of the turbine-powered transport aircraft will stabilize in the 500-600 mile-per-hour class "for 12 to 15 or even 20 years," according to Admiral DeWitt C. Ramsey, president of the Aircraft Industries Association. He based his prediction on the fact that the next speed increase would have to be in the supersonic range of 900 miles per hour and up, necessitating an entirely different type of power plant and airframe, as well as different structural materials.

time to change "problem" soil to

Friendly Soil

If you have "problem" soil in your garden—soil that packs, cakes and cracks—change it to "friendly" soil. Treat it with Krilium soil conditioner—it makes the difference in soil structure you see in the actual "facts-of-life" pictures reproduced here.

Make plans now to have a better garden in 1953! Put Krilium at the top of your gardening shopping list—buy it before you buy your seeds—treat all your garden plots and flower beds—give seeds the benefit of "friendly" soil—a real chance to germinate freely, form strong, healthy roots, emerge more plentifully... Krilium is easy to apply. Its action is lasting. Because it maintains soil in loose, crumbly condition, it saves you hours and hours of backbreaking work for years to come.



See how zinnias emerge freely, more plentifully and in excellent health, in soil that has been Krilium treated to maintain loose, porous, crumbly structure.

Get Krilium from your dealer's in 1-lb. and 5-lb. garden-formulation packages; in 10-lb., 25-lb. and 50-lb. full-strength-formula packages for treating larger areas.

Monsanto Chemical Company, Merchandising Division, 1700 South Second Street, St. Louis 4, Missouri. In Canada, Monsanto Canada Limited, Montreal, Toronto, Vancouver.

Krilium; Reg. U. S. Pat. Off.



Prepare soil for seeding as you usually do. Apply Krilium to surface — then mix in.



After Krilium is mixed into soil, follow your usual seeding practice.

Krilium

SOIL CONDITIONER

Helps Germination, Root Growth, Emergence
Maintains Loose, Porous, Crumbly Soil
A Product of Monsanto Chemical Company



Serving Industry... Which Serves Farmers

BUILD YOUR OWN POWER TOOLS

Exclusive GIL-BILT Build-It-Yourself Features

- No machining—build easily with hand tools only
- No blueprint reading — step-by-step pictorial plans, full scale patterns, actual photographs
- Sturdy wood, steel, and aluminum construction
- Capacity and performance of commercial tools
- Selling from \$100 to \$210.00
- Proven design—nationally advertised and sold for over 5 years

**SAVE
\$50
OR MORE**

GIL-BILT 10-INCH TILT/ARBOR SAW



- 27x28 in. table, 13½ in. capacity in front of blade
- 10 in. blade cuts 3¼ in. deep, tilts full 45 degrees
- Floor model 34" high, table always stays level
- New Departure ball bearing arbor, ¾" precision shaft turned down for ½" bore blades, alum. housing, shipped ready to run
- Jackscrew and 4½ in. dia. handwheel lowers and raises blade
- Cast aluminum miter gauge and self-aligning rip fence guide

GIL-BILT Metal Parts Kit includes Plans, ball bearing arbor, miter gauge and bar, rip fence guide, dado insert, lock knobs, jack screw mechanism and handwheel, and all other metal parts (less blade) **\$21.95**
Same Kit with 10" Combination Blade **\$24.90**
Same Kit with 8" Combination Blade **\$23.90**

GIL-BILT BELT SANDER

- 84 sq. in. sanding surface. Over 4 times the effective area of a 10 in. disc sander.
- Belt operates in either vertical or horizontal position, does all sanding operations.
- Driver drum and pulley turn on sealed New Departure ball bearings; tension drum turns on Chrysler Oilite bronze bearings.
- Spindle and tension mechanisms of cast aluminum, completely machined and assembled.
- Belt travels 1800 ft. per min. Over a MILE of straight sanding action every three minutes. Saves more "elbow grease" than any other tool.

GIL-BILT Metal Parts Kit includes Plans, ball bearing spindle, 4 in. driver drum, 3 in. tension drum, tension mechanism, table tilt segments, rubber tires, cloth sanding belt, and all other metal parts **\$16.95**



GIL-BILT 12" BANDSAW

- Cuts to center of 24 inch circle
- Handles stock up to 6 inch thick
- 18x18 inch table tilts 45 degrees
- Lower wheel and drive pulley runs on sealed New Departure Ball Bearings. Upper wheel runs on ½" bore Oilite Bronze bearings.
- Upper wheel tension and tilt mechanism of cast aluminum, completely assembled.
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws.
- Rigid cast aluminum wheels fully machined ready-to-install. Heavy rubber tires.
- Uses standard 78 inch blades up to ¾ in. wide.
- Fully enclosed mechanism for utmost safety.

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, ¼ in. blade, ball bearing spindle, tilt mechanism, blade guides, table tilt segments, and all other metal parts **\$21.95**

GIL-BILT 18" BANDSAW

- Cuts to center of 36 inch circle
- Maximum height under top guide 12 inches
- 26x28 in. table tilts 45 degrees
- Floor model. Motor and all moving parts fully enclosed
- Heavy ¾" drive shaft. Oilite bronze bearings never need oiling
- Rigid cast aluminum wheels precision machined, 18¾ in. dia. with rubber tires
- Upper and lower blade guides. Each has ball thrust bearing, self-lub bronze jaws
- Upper wheel tension mechanism of aluminum and steel, completely assembled

GIL-BILT Metal Parts Kit includes Plans, rubber tires, aluminum wheels, ¼ in. blade, drive shaft and bearings, tension mechanism, blade guides, table tilt segments, and all other metal parts **\$34.95**

Return Kit in 10 days For Refund if Not Satisfied
(Prices include postage within 300 miles. Over 300 miles add 5% to above prices.)

Also available — Plans and Parts kit for 8" Tilt/table saw.
Order Plans at \$1.00 each — Sent postpaid anywhere in the World or write for FREE descriptive catalog.

GILLIOM POWER TOOLS

P. O. Box 1-PB, Lambert Field, St. Louis 21, Missouri

imported, these names account for about 95 percent of the British sales in this country. The famous British Villiers two-cycle engine is the power plant for many of the small British models, and these engine units are imported separately. The fastest engine for use on extremely small dirt tracks is (and has been for 20 years) the British JAP (J. A. Prestwich), and a few hundred of these engines are mounted in special frames for dirt-track use.

Japan has resumed motorcycle production, but as yet has made little progress in the United States market. Most Japanese makes are lightweight singles. However, the new Meguro is offered in a 650-cubic-centimeter vertical twin.

The German motorcycle industry has made an amazing comeback since the war and some firms are building more units than they did before the war despite the bombing of almost every motorcycle factory in Germany. The famous shaft-driven BMW, the NSU, Horex, Zundapp and DKW are German makes whose sales are increasing in the United States.

Czechoslovakia made a strong bid a few months ago and many Jawa and CZ makes were sold from behind the Iron Curtain. However, in recent months sales of these models have dropped.

Of the Italian makes being imported, the Guzzi leads by far in sales. That firm produces an excellent but unconventional line, notably a machine with a 500-cubic-centimeter engine that lies horizontally and has an exposed flywheel—very unusual in modern motorcycle design. Italian design usually differs from the conventional United States or British models. The Italian Gilera and MV Agusta are four-cylinder models with overhead camshafts. They are built primarily for racing and have shown exceptional performance in Europe. Only a handful of these machines has been sold in the United States as they are primarily competition models in the 500-cubic-centimeter category. They are expensive and not designed for use by the ordinary rider. Italy has also produced dozens of new and fantastic motorcycles, scooters and power bicycles.

The Austrian Puch is unique in that it uses two pistons in a single-cylinder, two-stroke (two-cycle) engine. These are very popular in some parts of the United States.

France has also produced many new cycles, mostly light models, scooters and bicycle engines. A few French makes like the Peugeot and Motobecane have been sold here as well as a few Saroleas and F-Ns from Belgium. However, the total sales have made no serious dent in the

(Continued to page 284)

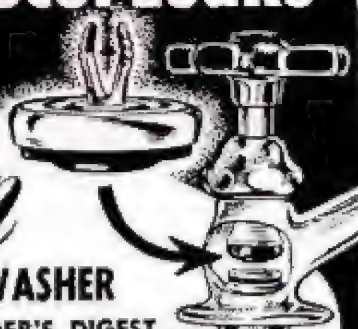
STOP Faucet Leaks for years!

SNAP-in

SWIVEL WASHER

FEATURED IN READER'S DIGEST...

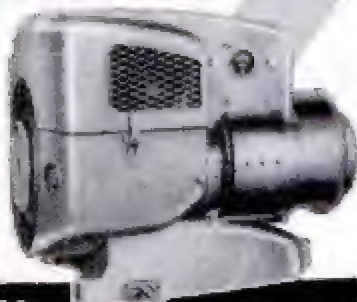
This amazing faucet washer lasts 10 to 20 times longer than ordinary washers. Patented swivel action allows washer to seat tightly without grinding—practically eliminates wear. Genuine Neoprene face disc. Snaps into faucet stem—no special tools needed. Ask your hardware dealer for Snap-in Swivel Washers. 3 for 69c. Accept no substitute. If dealer cannot supply, send 69c and bibb washer size to Snap Products Co., Division of Harrison Industries, 847 W. Harrison St., Chicago, Ill.



ELECTRICITY *Anywhere*

FOR PORTABLE, EMERGENCY OR HOME USE

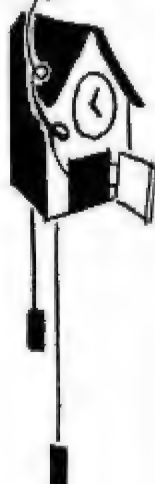
ONAN Electric Plants generate 110-volt, 60-cycle current for homes, farms, cabins and resorts beyond the highline. Lightweight, portable plants cut costs, speed work for contractors. Standby plants protect units against power failure. 400 to 55,000 watts. Gasoline or Diesel-powered. Priced from \$219.00.



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FEBRUARY 1953

E-L-I-M-I-N-A-T-E COSTLY ERRORS on your HOME POWER TOOLS

for only
50¢

- Removes "glaze" from V-belts
- Makes belts slip-proof
- Makes belts last longer



Have you ever searched for weeks to find just the right piece of wood for one of your home projects, and then ruined it with a sudden nick or gouge from one of your power tools? In most cases, this is caused by V-belt slippage when the "load" gets a little heavy, and can cost you plenty in time, labor and frayed nerves.

V-belt slippage is caused by the formation of a "glaze" which is the result of normal usage and from contact with the metal of the pulleys. Cling-Surface dissolves the "glaze" and restores the belt to its original pliable condition. A few drops applied to the pulley side of the belt is all that is necessary to put any V-belt in top working order and keep it that way for many years. Cling-Surface also does the same job for your car, washer, dryer, furnace blower, snow plow, power lawn mower, etc.

Get it at your service station,
auto parts or hardware store.

MONEY BACK GUARANTEE

FOR FASTER, SCRATCH-FREE SANDING.....USE DREMEL STRAIGHT-LINE ACTION SANDERS



Price includes sturdy steel storage case;
25 asstd. abrasives; 1 sheepskin pad.

WORLD'S FINEST FINISHING SANDERS — Patented Straight-Line Action sands with the grain of the wood—eliminates cross grain scratches and orbital swirls.

MORE SANDING SURFACE PER DOLLAR means more work done. Faster action (14,400 sanding strokes per min.); more than three times as fast as other type sanders!

POWERFUL, high-speed, lifetime reciprocating motor (110 V. 60 cycle A.C.)

EASY, ONE-HAND OPERATION less tiring on vertical and overhead operations. Sands into corners — other tight places.

TROUBLE-FREE USE assured. Only two moving parts; never needs oiling. No armatures, brushes, gears or bearings to wear out and replace.

Professional Model 2000 is a favorite with carpenters, painters, contractors and family handymen! Ideal for finish sanding on flush doors, panelling, cabinets, etc. Superb for waxing cars, polishing furniture, etc.

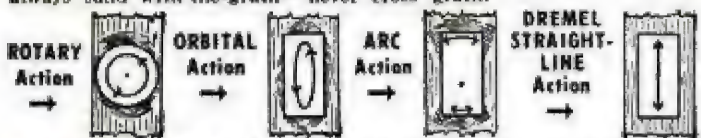


A "must" for dry-wall joints.

Sands into tight corners.

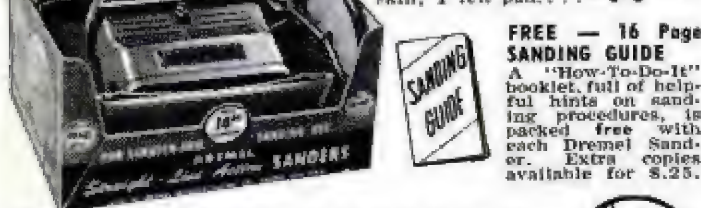
Ideal for refinishing.

TRY THIS SIMPLE TEST: Sand a piece of wood by hand, using the four motions below. Note the slightest cross-grain action produces scratches and swirl marks. Sanding with-the-grain gives scratch-free satin finish. This test proves conclusively why professional craftsmen always sand with-the-grain—never cross grain.



FOR HOBBYISTS... HANDYMEN AND HOUSEWIVES

Lighter-capacity Model "A" is an all-purpose sander — polisher — massager. Takes the work out of polishing, sanding, etc. Effective body massager, tool. Weight 2 1/4 lbs., has 12 sq. in. (2 3/8" x 5 3/8") sanding pad surface. Price includes 6 abrasive sheets; 1 sheepskin; 1 felt pad. . . . **\$14.85**



SEE YOUR DEALER! If he can't supply, order direct on five day trial, money-back guarantee. Remit in full for postpd. shipment; or, send \$2. now, pay postman balance plus postage and C.O.D.
DREMEL MFG. CO., Dept. 113-B, RACINE, WIS.



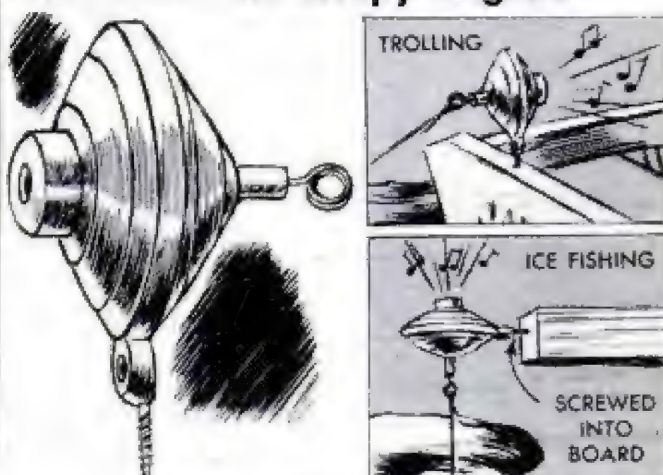
over-all sales picture. Most French and Belgian makes follow the general British design with some odd front and rear suspensions being featured.

There are so many different types of competition events that it would be almost impossible to list the results of all those now popular in the United States. Harley-Davidson has been extremely successful in certain competitions and holds 14 national track championships at this writing. Triumph and BSA have accounted for several championships in different categories and other foreign makes have won state or national crowns. Indian riders have excelled on half-mile and mile tracks.

British makes have been tops in the 200 and 100-mile professional and amateur championship races held annually at Daytona Beach, Fla. Year after year, the British Norton 500-cubic-centimeter International model with overhead camshaft has won these events. The same make has won almost all of the famous road races held on the Isle of Man for many years.

No one can foresee exactly what design the motorcycle of the future will take, but certainly we should expect tremendous advances. Judging from present trends, within the next few years I expect to ride a motorcycle with an engine half the size of present models that will outperform today's best. I expect that the race for horsepower will be based on a continual drive for smaller displacement rather than the constant increase in engine size that the automotive engineers seem to feel is necessary for added power.

Fish Alarm for Sleepy Anglers



Not even the slightest tug on your fishing line will go unnoticed if you're equipped with a device that whistles a warning when the line is jerked. Fishing line is passed through and tied to a plunger hook on the side of the device. Pressure on the line moves plunger, activating a whistling squeaker similar to those in inflated toys.

best
white tape
made

ONLY
98¢



The new "Evans White-Tape" has everything you'll find in tapes costing over \$1.50—plus.

- snow-white blade with bold, legible, jet-black numerals and graduations. Graduated in 32nds for first 6 inches.
- sturdy die-cast case heavily chrome-plated, calibrated for quick reading inside and outside measurements.
- blade $\frac{1}{8}$ " wide made of finest high carbon steel—tempered—Bonderized—enamelized—baked.
- blade replaceable in seconds—without tools—without even opening case. And Evans replacement blades cost far less.
- every "Evans White-Tape" is unconditionally guaranteed.
- exclusive Evans automatic brake gives smoother push-pull action with absolutely no "creeping" of tape into case.
- underside is white, too. Mark with ordinary pencil, remove mark with flick of thumb.
- unheard-of low price*: 10-ft. \$1.49; 8-ft. \$1.19; 6-ft. 98¢. Prices higher in far west and Canada.

Evans

Sold only through retailers.

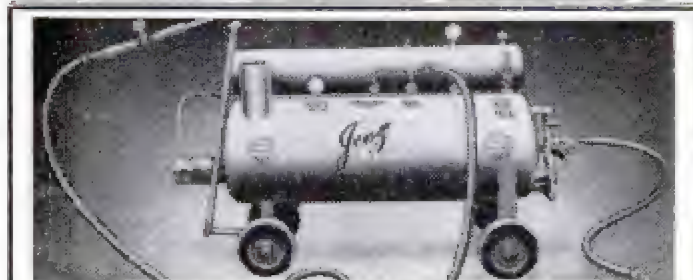
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Makers of Evans 6 ft. Folding Rule and Folding Yardstick

STICK with **LEPAGE'S**

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LIQUID GLUE
For Wood

LEPAGE'S INC., Gloucester, Mass.
GLUEMAKERS FOR 73 YEARS



EARN \$6.00 PER HOUR

At a cost of 20¢ with the NEW JENZ SUPER CHIEF STEAM CLEANER. Portable—No moving parts—Cleans anything—Any place—Motors—Chassis—Machinery—Floors—Buildings—Oil Rigs, etc.—Oil fired—Economical—Fully tested and warranted. 75 lbs. steam in ten min.—Model 90. Complete as illustrated. **\$388.50**

F.O.B. shipping point

HI-PURE LABORATORIES, Evansville, Ind.

MOST PRACTICAL TOOLS YOU CAN OWN!

DREMEL Electric MOTO-TOOL

1001 USES AROUND THE HOME AND SHOP

Here is the fastest (27,000 r.p.m.) most powerful tool in its class—THE ORIGINAL POCKET-SIZE MACHINE SHOP. A Jack of all trades around the workshop, it is indispensable for carving, drilling, grinding, and for sharpening tools, scissors, kitchen knives, garden tools, lawn mower blades, etc. More versatile than a $\frac{1}{4}$ " electric drill as it is so light weight (13 oz.) and handy for so many small jobs. Perfect for drilling small holes to hang pictures, installing cabinet hardware, hardwood trim. Powerful, 110 V. A.C.-D.C. motor. A tool built for years of lasting service.



MOTO-TOOL NO. 2 offers more conveniences and long life features for the money than any other hand grinder. Thousands of satisfied users. Moto-Tool No. 2 (with 1 emery wheel point).....

\$16.50

KIT NO. 2 Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hardwood case....

\$23.50

A PRECISION TOOL WIDELY USED IN INDUSTRY



For Sharpening Tools



Speeds Up Repair Jobs



Great for Hobbyists

AMAZING FOOT-A-MINUTE
(7,200 Strokes Per Min.)
CUTTING SPEED!

FREE PLANS!
Make your own jig saw. Complete plans and six project patterns included FREE.



Only **\$5.85** with 3 saw blades

FAMOUS DREMEL ELECTRIC MOTO-SAW

Here is a genuine craftsman's tool with dozens of household and workshop uses. It is perfect for all sorts of coping and jig saw work making window valances, knickknacks, hobby projects, etc. High-speed, reciprocating-type motor easily cuts asphalt and rubber tile, also masonite and formica—wood up to $\frac{3}{4}$ ". Perfectly safe for children—so easy to handle that women love to use it. Has only two moving parts, never needs oiling. A high quality tool used by craftsmen, tile layers, and carpenters.



Cuts scrolls like magic!

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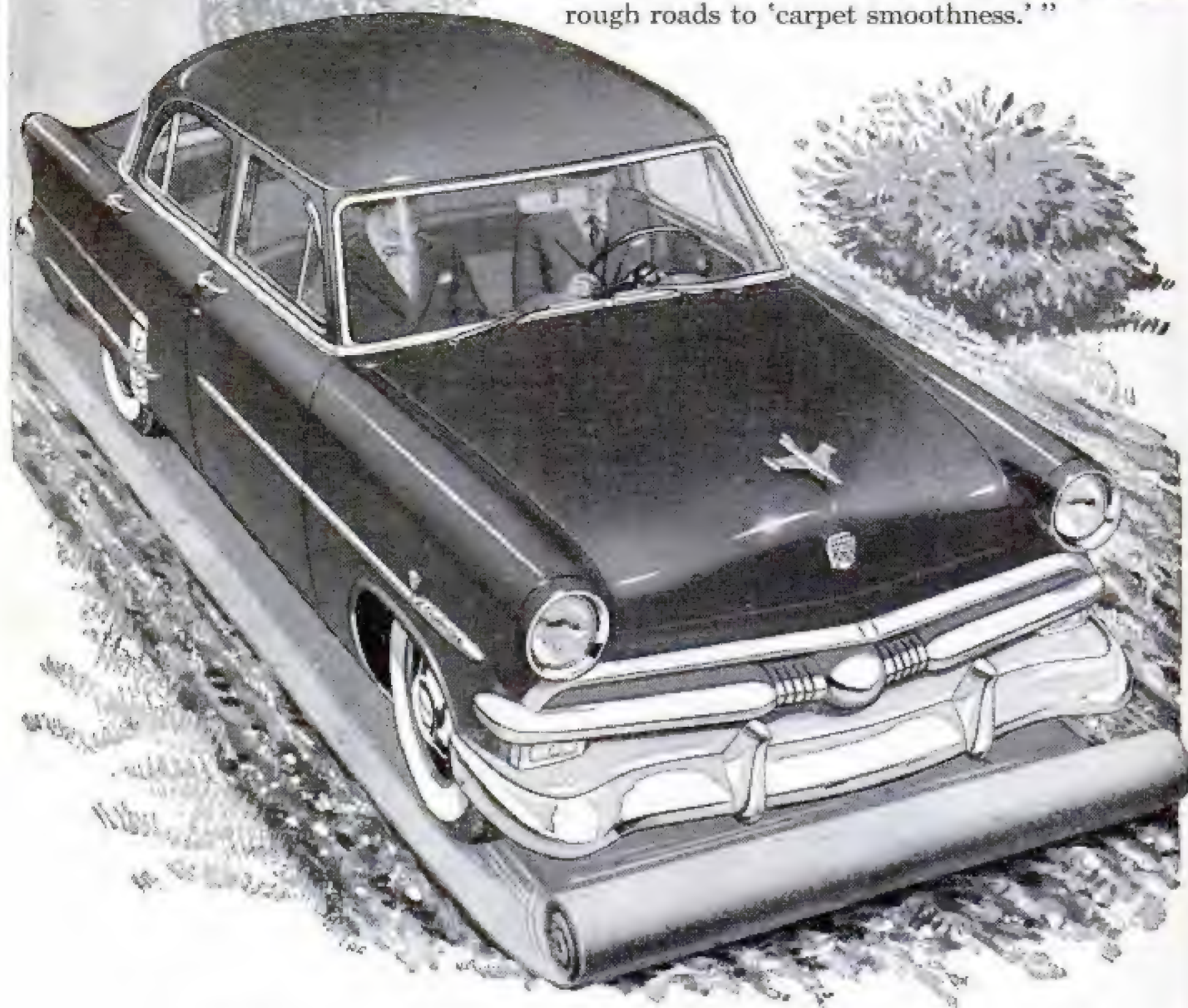
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The How of Ford's



Dr. Roy K. Marshall explains one of the 41 "Worth More" features of the '53 Ford

● "A popular misconception is that a car has to have excessive weight to ride smoothly and evenly. Yet, if weight were the main factor, then heavy trucks would ride better than passenger cars! The secret of a smooth ride is not weight but the coordinated action of such ride controlling elements as shock absorbers, front and rear suspension, tires, and seat springing. Ford engineers have developed this concept to a remarkable degree in the new '53 Ford . . . in fact Ford's new Miracle Ride reduces rough roads to 'carpet smoothness.' "



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How road shock is reduced 80%. "When Ford chassis engineers increased the vertical travel of the front wheels and softened the front suspension compression bumpers in the '53 Ford, they reduced front end road shock by as much as 80%! Then rear springs were redesigned to just the right resiliency for precisely harmonized action with the front springs, so that the

car moves up and down evenly without 'pitching' from front to rear. The development of more responsive shock absorber action was the next step—an all-important one to obtain perfect coordination between 'shocks' and springs at both front and rear. The result was an amazingly soft, smooth, *level* ride on boulevard or rough back road."

How a wider front tread increases stability. "A car with a wider tread in front is far less susceptible to sidesway, especially on curves. So Ford engineers designed the front tread two inches wider than the rear tread for greater stability. They mounted rear shock absorbers diagonally to further reduce 'heeling.' "



How foam rubber cushions help. "The little road shock that *can* get past the chassis gets no further than Ford's foam rubber cushions. They sit soft, but firm, on non-sag springs, add the comfort of living room chairs to the other advances of Ford's new Miracle Ride."

'53 Ford

White sidewall tires optional at extra cost. Equipment, accessories and trim subject to change without notice.



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3

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Look What's Happening to Your Blood

(Continued from page 86)

What does this mean to the physician? "A newborn child is in convulsions," explains Dr. Albert Sobel, of Brooklyn. "The doctor can't tell why. The baby's blood must be tested for eight different things—but he can only take a few drops with safety. That's all he'll need. Down it goes to the chemistry laboratory where it starts through the analyzing machine. A few minutes later the report is in—seven tests are normal, but the eighth shows low blood calcium. The baby is given calcium—convulsions stop—the baby gets well."

Chances are, too, that before long the blood you donate will flow into one of those plastic bags Doctor Cohn uses on his machine—instead of a bottle. The Army is testing them in the field. A complete donor set weighs five times less and takes less space than seven conventional bottle sets. The flexible vinyl won't break. It can be shipped without padding and tossed away after use. Accessories are so simply rigged that amateurs can give transfusions with a minimum of instruction.

For years, one problem in transfusions to people who were bleeding violently has been to get blood or plasma into them fast. If too little blood feeds into the left side of a heart, the heart will stop. And ordinary gravity transfusion of a pint of blood takes 40 minutes. Until recently, doctors used air pressure in the top of the blood container to force the fluid into the patient, but it was dangerous because massive air bubbles might reach the heart and stop it. Now, a new pump invented by Jan Petri of the American Optical Company has solved the problem. The simple machine is no bigger than a fishing reel, and can push a pint of blood into a person in a minute and a half. The tube from the bottle fits in a circular groove around the pump. When pressure is needed, the doctor turns a handle and a tiny roller circles around, stripping the tube continuously and pushing the blood along in front of it at any rate of speed needed.

Dozens of other devices and techniques are adding to our knowledge of blood every day. With a tiny optical chamber he invented, Dr. David Drabkin of the University of Pennsylvania can poke into a living artery and study blood cells while they're actually cruising around in the system. A new "scintillometer," 300 times more powerful than a Geiger counter, can measure infinitesimal radioactivity in the blood stream.

(Continued to page 290)

Sportmen Rally to the "Action Test" Ride

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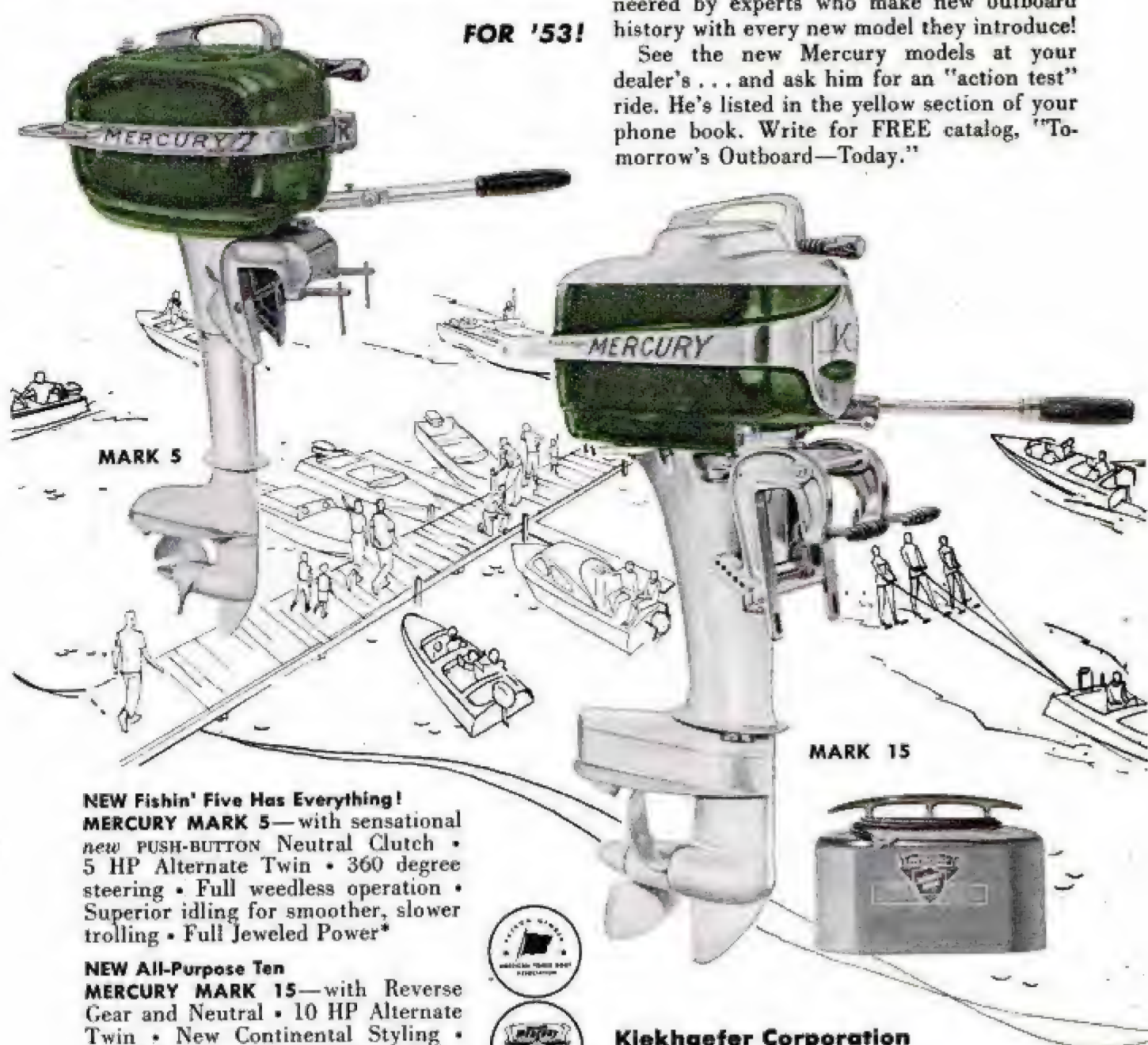
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Until all these new things are proven, however, the Red Cross needs your donation the same old way. Plasma will carry the big load for some time to come. With all its shortcomings, it does a tremendous job. But the stockpile of plasma is not what it should be to meet current demands. To stretch it, chemists recently have come up with synthetic blood extenders. They don't begin to do the job of plasma, much less of whole blood. But they will boost the blood volume in a hurt body. Several kinds are being produced today under names like Plavolex, Expandex and PVP-Macrosee. Most use dextran, a sugar, as a base, so they're being produced by strange outfits. A whisky company makes one, a textile manufacturer another. At California Institute of Technology, a gelatin produced from bones and skin, called Oxypolygelatin, is doing a blood-extending job. Warming liquefies it for transfusion.

In a pinch these extenders will help, for they are being stockpiled in vast quantities. But there is no substitute for real blood, and the day probably will never come when your blood donation will not be needed—if not for immediate use, at least for the stockpile of whole blood scientists hope will soon start building. Right now, its need is immediate, and you can be sure that none of your donation will be wasted.

What happens to the pint of blood you give to the Red Cross today? Within 48 hours of the time you donate, it arrives in an ice-chilled container at one of eight laboratories strategically spotted around the country. These processing centers operate under operating-room sterility and modern factory efficiency, handling from 25,000 to 50,000 donations a month. Immediately, the blood starts down a production line, attended by men and women in white who wear masks to prevent contamination as the fluid goes through the 25 steps necessary to convert it into packaged plasma. Your donation is checked, tabulated and near-frozen in a cold room, then whirled in stainless-steel centrifuges until the amber plasma is all on top. In a spic and span room, a sterile needle dives through the bottle top and draws off the plasma by vacuum. It goes into big tank "pools," from which it is drawn after the tanks are full, and fed to another centrifuge that whips out the fat cells. It then flows out around ultraviolet tubes designed to irradiate it and kill any virus it may contain. One company uses a tricky revolving drum that dips into the plasma and carries it over the top in a thin film which can be thoroughly irradiated. It is stripped off on the other side and sent along.

(Continued to page 296)

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Antiques on Parade ... The Glidden Tour

(Continued from page 133)

wires that have jarred loose. Crystallized old metal sometimes cracks, as did the chassis tie rod on Schonberg's Binford, requiring a welding stop.

Mechanisms on the old cars are absurdly simple compared with today's automobiles. When he lost his clutch, Garganigo got out, took down the DeDion's transmission (which looks like something on a power lawn mower), put it together and was back on the tour in 15 minutes. When an intake line broke, he wrapped it with string, jammed it back in the fitting and rode merrily along.

Antique automobilers are a special breed. They have to be. Finding and resurrecting the old chariots require diplomacy, patience and mechanical wizardry. Ted Rivers bought his old Ford from a junk yard and worked on it nine months. It cost him twice what he paid for the wreck to make it look like an automobile again.

Real collectors like Garganigo, who with his brother Al runs an old-car museum in Princeton, Mass., have an instinct for spotting old cars hidden in barns, basements and even in attics of old houses.

"Recently," says Garganigo, "in a gen-

eral store up in New England, a boy told me about an old man who drove a 1903 one-cylinder Rambler up a steep trail to his farm and couldn't get it down again. So I went up there and, sure enough, the Rambler was still there—a wreck. I pleaded and bargained and finally the owner parted with the thing grudgingly. We took it apart, carted it home and worked on it for months. It's one of the best restorations in the museum."

Sometimes the cars are completely dismembered when they're found—piled in a back-yard dump or building. The boys call these "basket cases." Schonberg's Binford was one of them. The man who owned it had taken it apart bolt by bolt, piling the 400-odd pieces in bushel baskets so he could stow it in his cellar. Without a plan to work from, Schonberg rolled up his sleeves and within three months had the whole thing together and a coat of bright yellow paint on it, rubbed to a high finish.

On the tour, great pains are taken to keep the old cars running. A day's run ends several hours before sundown so drivers can work on the cars. While the men are busy under the hoods, wives are dusting and shining. Even the springs, axles and undersides of fenders are painted and have to be polished until they sparkle.

(Continued to page 294)

UNCLE WALTER

IT SMELLS GRAND



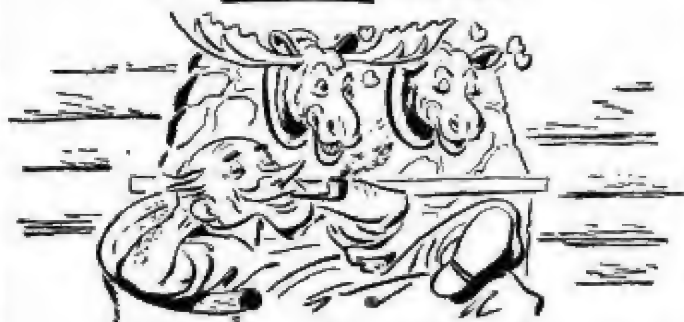
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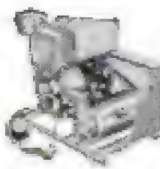


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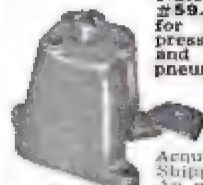
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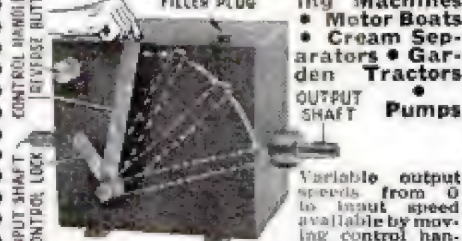
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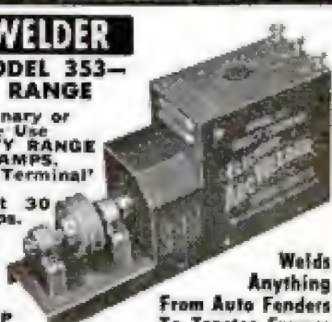
Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Overall dimensions, 7 1/2"x7 1/2"x1 1/2". Gov't acquisition cost, \$428.00. Ship. wt. 31 lbs. Complete with 2 qts. of oil and full instructions. F.O.B. Chicago... **54.50**

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When the five-car convoy pulled into Harrisburg it joined scores of other old-timers in the city's big square. The oddest-looking cars (which later won prizes at the big banquet in Washington) drew especially large crowds. Garganigo's DeDion was one of these. Another was Raymond Levis' first model Cadillac. Its front end looked like a ski jump and housed a one-cylinder water-cooled engine. It had sold for \$850 in 1903.

A Holsman high-wheeler owned by D. S. Baker was nothing more than a Jenny Lind buggy with a two-cylinder motor under it. The drive mechanism was simply Manila rope running from the motor shaft over a pair of big rings on the rear wheels. It had buckboard, coach lamps, wood-spoked wagon wheels and was only a pair of shafts away from a horse-drawn vehicle in 1902.

Briggs Cunningham rolled up in a handsome 1910 American Underslung. This car's all-aluminum body hung from beneath the axles, making it only slightly higher than its huge 41½-inch wheels. The car was designed by Stutz of Bearcat fame and originally sold for \$4000.

Finest of the foreign cars was James Melton's 1907 Rolls Royce—a touring car you could stand up in with the top raised. Melbourne Brindle's two-tone Crane Simplex cost its first owner \$33,000 in 1916. Like a yacht, it was trimmed in teakwood. Brass deck funnels on the cowl cooled the driver's feet. It could do 75 miles per hour and was guaranteed for the life of the owner (until the company folded a few years after starting).

Dozens of other prize winners, too numerous to list, dribbled into Harrisburg all day. That evening was spent preparing the cars for the big run to Washington on the next day.

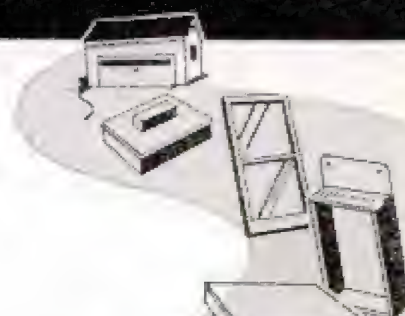
In the morning everyone was in full antique regalia—men wearing dusters and peaked caps with goggles, some with mustachios pasted on upper lips. Women wore huge flowered hats, veils and mutton-sleeved dresses. Off to Washington went the whole gang and there was held the grand finale—a mile-long parade of old cars down Constitution Avenue. After a banquet given that evening by the AAA in conjunction with its 50th anniversary—prizes and cups went to the outstanding cars. The tour was over for another year.

Next day, the relics scattered in all directions—some on trailers, some under their own steam. When Garganigo announced that his DeDion was tired, but he was driving it home anyway, he was advised not to worry. "If it breaks down," someone cracked, "you can always put a three-cent stamp on it and drop it in the mail!" ★ ★ ★

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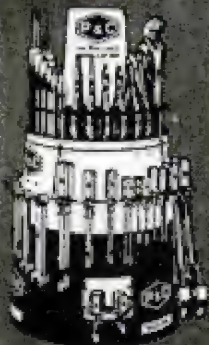
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Finally the plasma runs into bottles, sealed so that vapor can escape, but contamination cannot enter. Thus it may be shipped as liquid plasma. But some bottles will go on to the drying process, where an alcohol bath chills them to a minus 80 degrees Fahrenheit, forming a shell of frozen plasma inside the bottle. Vacuum ovens complete the drying. When the bottles come out, permanent caps with rubber centers that can be punctured by a needle are substituted for the seals. Down the rows of bottles goes a lab worker with a black gadget producing a high-frequency spark against each container. It makes a purple glow in properly sealed bottles. Batteries of rabbits get transfusions from each batch of plasma. If their temperature stays normal, the fluid is satisfactory.

Then, bottle, needles and tubing are packaged in a nitrogen-filled (to preserve the rubber) container, and hermetically sealed. With this package goes a bottle of sterile fluid, similarly packaged, to dilute the dried plasma. Each unit of two bottles and administering equipment goes into a big carton — all ready for transfusion on battle front or civilian front anytime within five years.

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The Mexican Road Race

(Continued from page 128)

brake bands several times a day. Some of the accidents undoubtedly occurred when drivers hit their brake pedals and found they had no brakes left at all.

Most brake troubles come from overheating. In the case of the Lincolns, Clay Smith installed air scoops that blew steady drafts of fresh air into the perforated backing plates of the front brakes. There was no room for attaching scoops to the rear brakes, so he hooked a couple of blower fans to large diameter tubes inside each car and led the tubes down to the rear brakes. With this arrangement there was always plenty of pedal.

"Last, but not least, we come to the drivers," Clay remarks. "We picked Chuck Stevenson, Johnny Mantz and Walt Faulkner to pilot the three cars. Stevenson is the 1952 A.A.A. big-car champion, Mantz holds several sprint championships, and Faulkner has set several qualifying records at Indianapolis. But the drivers were not picked because of their records as much as because they are exceptionally smooth drivers.

"Instead of manhandling a car around a turn, these pilots put their cars into a curve as smoothly as possible. There's none of the swerving and jamming on of brakes that suggests that the pilot is driving over his head. Smooth driving saves rubber and brakes, gets you through the turns faster and gives you a margin for emergency maneuvering."

Nearly every driver toured the entire route before the race to become familiar with the road. Co-drivers made notes of the most hazardous spots. The Germans spent days of practice on the toughest stretches. The Italians painted bright yellow spots on the pavement approaching the most hazardous turns. Many of the other drivers depended only on the standard highway caution signs with which the road was well posted.

Beginning with next fall's race, the Pan-American contest becomes one of the five races on which international road-racing championships will be decided. The F.I.A., governing body for world automobile championships, has ruled that the Pan-American race (Mexico) is to have the same status as the Mille Miglia (Italy), the 24-Hour Le Mans (France), the Nurburgring (Germany) as well as the Tourist Trophy (England). ★★★

❏ Said to be the thickest bed of coal in the world, a seam reaching to 400 feet in depth has been worked as an open pit for over 600 years at Fushun, Manchuria.

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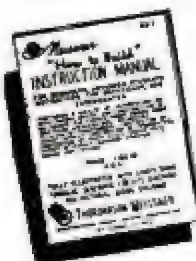
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"Can't open the blankety-blank thing," he says. "Blankety-blank key won't turn."

"Have you lubricated it lately?" I asks. "Guess I haven't," he says. I says, "O.K., I'll show you a trick."

So, I went over to the house and got my tube of Lubriplate. "Let me have your key," I said. Joe handed it over, I put a light coat of Lubriplate on it and handed it back to him. "Now try it," I says. Well, he put the key in the lock, worked it around a little, and the lock turned. "That is quite a trick," he says. "I never even thought of putting Lubriplate on the lock, let alone the key." "Be sure to wipe your key off before you put it in your pocket," I told him, "and put some Lubriplate on that lock. Incidentally, it's good for all your locks, including the ones on your car, it's swell for your garage door rollers, too—keeps them from jamming up."

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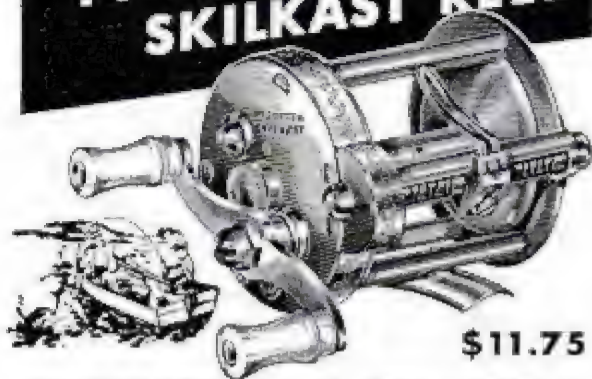
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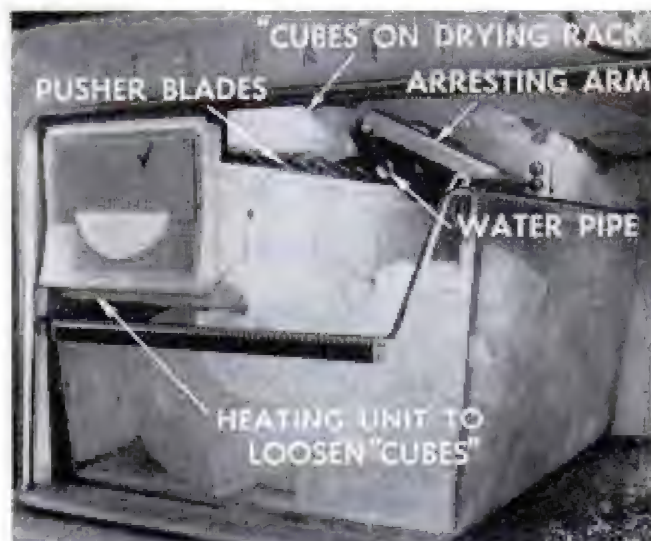
There's a Pflueger Reel for every type of fresh and salt water fishing from \$2.10 to \$35.00; also Baits, Spoons, Hooks, and Lines. Using Pflueger tackle makes any fishing better. Ask your dealer.

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Take Tabcin

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American Engineers Look at Foreign Cars

(Continued from page 123)

think it does contribute to safe driving.

Q: If you stiffened up cars to where suspension was more like a sports car, do you feel it would, in the long run, lead to as many accidents, but from different causes, such as fatigue?

GRAVES: Yes. Most of these dangerous corners come up on a driver unexpectedly and he must be alert. I don't know that there is much difference in the speed at which you can take a corner even in the best sports car today against our own. I don't mean to say there isn't some difference, however.

Q: To turn from lock to lock on a sports car requires only two turns of the wheel whereas on ours it is as much as four or more. To react to a traffic situation the driver has to move the wheel two or three times as far as the sports-car driver. Does that contribute to accidents?

GRAVES: I don't know whether we can answer that either, but we do know definitely: With power steering drivers are taking corners sharper and faster than they do with conventional steering even without changing the ratio or the number of turns of the wheel. The tire companies are finding it out and we are finding it out too.

WALKER: Talking about the progress of the automobile in America, remember when passengers sat away back in the rear and there was a tremendous hood? It is still like that in Europe. After that we added a little trunk on the back. Then we got a more rounded trunk, pushed it up a little farther. After that they pulled the headlights in and started to take the snoot and straighten it up and took the windshield and put a little more rear on the car. Then came the fast back and the nose was moved up considerably. This gave what we call good balance which means better riding.

Q: Do you think we are going back to any of that? Wire wheels are back.

WALKER: That's just a detail. It is something that is a sparkle. We lost the sparkle down below. I don't think the Europeans taught us that, but the sparkle that is picked up as the wheels revolve gives us a little more intriguing something.

Q: There are some European cars with rear engines. Is the trend there toward or away from rear engines?

MACAULEY: I think I can answer that. You might include front-wheel drive in that too. The people that are using front-wheel drive and rear engines are sticking

(Continued to page 304)

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1/2" to 1" with 1/2" Shanks

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Will Fit Any Size Chuck 1/4" and Larger.

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17/32	1.14	51/64	2.05
35/64	1.14	13/16	2.05
9/16	1.14	53/64	2.15
37/64	1.24	55/64	2.25
19/32	1.24	7/8	2.25
39/64	1.30	15/16	2.43
41/64	1.43	31/32	2.50
21/32	1.43	1-1/32	2.80
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3/4	1.80	1-5/32	3.98
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SIZE	PRICE EA.	SIZE	PRICE EA.
1/4	\$.30	25/64	\$.60
17/64	.45	13/32	.60
9/32	.45	27/64	.65
19/64	.48	7/16	.65
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St. shanks, same size as drill, 1/4" to 1/2".	



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1-1/32	6 1/2"	2.76	1-25/64	7"	5.75
1-3/64	8"	2.82	1-13/32	8"	5.80
1-1/16	7 1/4"	2.82	1-27/64	5"	5.80
1-5/64	7 3/4"	3.00	1-7/16	6"	6.00
1-3/32	6"	3.33	1-29/64	6"	5.80
1-7/64	9"	4.00	1-15/32	8"	6.13
1-7/64	18 1/2"	8.50	1-17/32	7"	7.16
1-1/8	8 1/2"	4.00	1-35/64	8"	7.25
1-9/64	7"	3.75	1-39/64	7"	7.75
1-5/32	6 1/2"	3.80	1-21/32	7"	8.00
1-11/64	7 3/4"	3.85	1-27/32	7 1/2"	11.00
1-13/64	7 1/2"	3.95	1-7/8	9"	11.90
1-7/32	8 1/2"	3.25	1-29/32	6 1/2"	12.00
1-15/64	7 1/2"	3.70	1-31/32	7 1/2"	10.00
1-9/32	7 1/2"	4.51	2-5/16	7"	16.25
1-19/64	5 1/2"	5.00	2-7/16	11"	21.50
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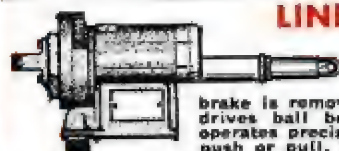
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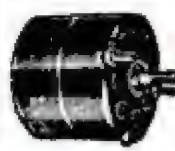
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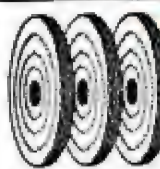


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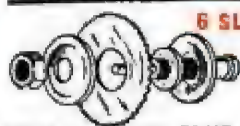
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with them and certainly there are none with conventional design changing over.

Q: Why is it that the rear engine, which looks logical, isn't an ultimate step?

GRAVES: One reason is that you can't put a luggage compartment in the front that corresponds to the rear and it certainly couldn't compare with our Packard space. In addition, as long as we use water-cooled engines, you have to get them cooled and it is a noneconomical place to put it in the rear.

Q: Can we expect pancake engines?

GRAVES: Pancake engines would make the hood lower, but it also makes the car wider and then you can't turn it. So I don't believe you are going to have pancake engines. It is going to affect your turning radius unless you put it in the back and we already mentioned the problems there.

Q: Are there cars in Europe with rear transmissions?

GRAVES: Yes and I think that is the most logical change there is, designwise. We haven't yet arrived at that, but it does have merit. That is a way to get more weight on the back end and to tie it in with your rear-axle gears.

Q: What about air-cooled engines? There are quite a few European air-cooled designs.

GRAVES: We saw no evidence that air-cooling will spread.

Q: Are sealed cooling systems coming?

GRAVES: We practically have sealed systems right now. Everybody has from a 7 to a 13-pound pressure cap on their radiators. It isn't fully sealed, but it is a pressure system. I don't foresee any great increase in that pressure however.

Q: Would it be easier to put automatic transmissions in the rear than manual?

MACAULEY: I think so. You wouldn't have to have the long shifting rails on an automatic model.

GRAVES: It would eliminate the hump in the front floor. We wish we didn't have it, but I don't think it is a real drawback. Ed does. He and I don't agree on that. I don't think people would pay five dollars extra to get it out of there. Until we can put a transmission back in the rear and make it as cheap as the present cars are, I don't think you can put a premium into your car for moving it back.

Q: Why don't we have torsion-bar suspension here? Even low-priced European cars have it.

GRAVES: We don't think there is any torsion-bar suspension that gives you any better ride for the same amount of money than you can get with conventional springing. A torsion bar is no different than a coil spring. It is just a different way of doing

(Continued to page 306)

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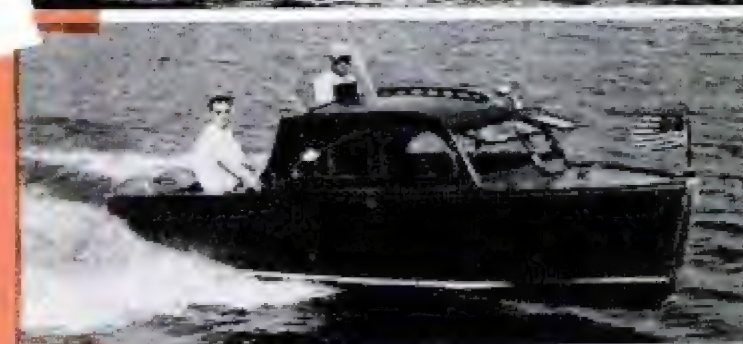
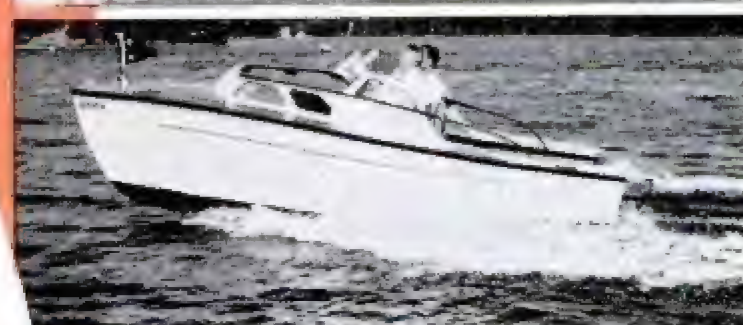
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the job, but it doesn't give you any different action. I am not saying there isn't something that can be done with torsion bars, sometime in the future.

Q: Is there no real gain from it as you see it today?

GRAVES: As far as anything that has been built and is out and that we know anything about, no. For instance, on rear springs one manufacturer changed from coil springs back to conventional leaf springs. They went that way in the rear, then backed up. There is no friction in the coil and friction is desirable in springs where you have so much bounce as you have in the rear.

Q: Haven't designers and salesmen shifted the emphasis in the American car from the engine to something else?

WALKER: Yes. To comfort mostly. Comfort and a nice package, highlights, something of beauty going down the street. That is the American way. How the highlights play up. How comfortable is the car? What is the trim? Is it your living room on wheels? Is it easy to operate for the woman? That is what is selling the car today. It is taken for granted that the engineer has done a marvelous job.

MACAULEY: You can't go out and buy a poor car mechanically, no matter what price class.

Q: In Europe, though, isn't the principal emphasis still on engines?

WALKER: Yes. In the Paris and London shows most cars are shown with the hoods up. People are standing around looking at the engine. You ask 10 or 12 persons standing there something about the engine and they can't answer you. But they like the engine. That was the thing they looked at. Americans no longer have the interest in engines they had years ago. Now it is the general package, that is, everything. Highlights, beauty, color, everything combined with the engine.

Q: Is there anything you saw in Europe that might be useful in projecting models of the future?

MACAULEY: Styling, yes. Engineering, no. There are some what I would call bits and pieces on many of the Italian designs that were excellent.

GRAVES: I think as far as standard-production automobiles over there are concerned, we can almost say that we got little either stylewise or mechanical-wise. But the custom cars and sports cars, I think it is fair to say, whet our appetite for a low silhouette, a good-looking over-all appearance. And I think we will see if we can style some Packard cars that give you that same impression.

(Continued to page 308)



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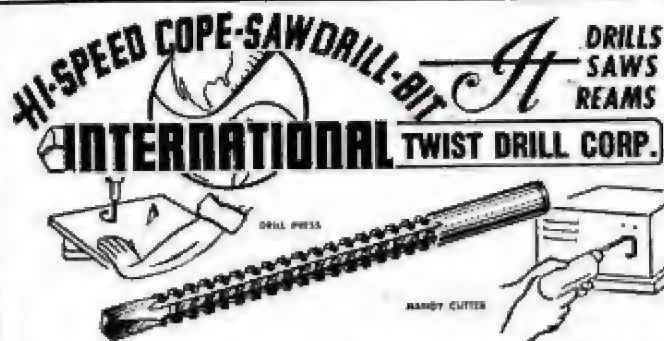
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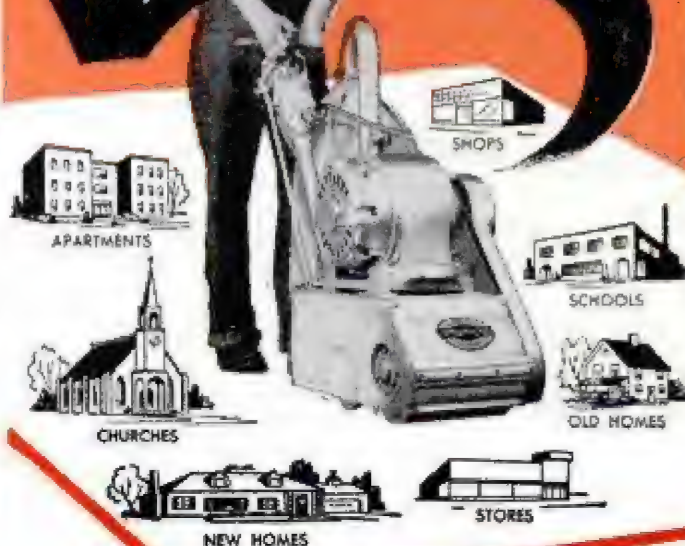
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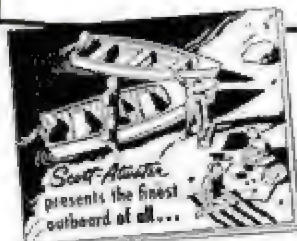
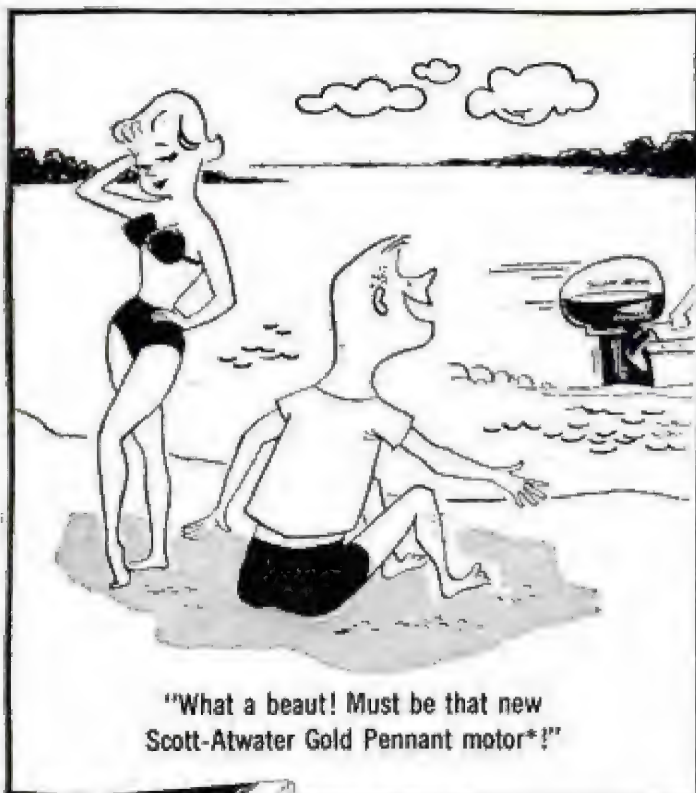
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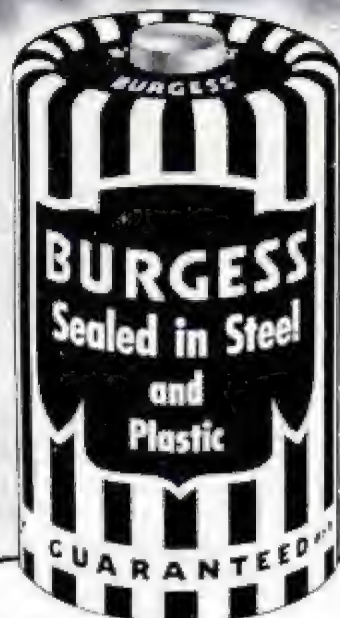


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WALKER: It is whetting the appetite for something different in a two-passenger sports car. Somebody is going to satisfy that demand. If the car can be made to sell for about \$3000 they are likely to sell a lot of them to the guys that like that kind of car. I know they will never make any money, any more than Lincoln made money on the Continental when they sold it. But they will capture the public's eye. I think there is definitely a market for a four-passenger or two-passenger sports car.

GRAVES: People frequently ask me why we don't do this or that to our cars. Let me say something about this. We are always up against a compromise in engineering. I don't care what it is.

Q: Europe has been using the 12-volt system all along. We seem to be heading toward it. Any comments on this?

GRAVES: Ultimately 12 volts may save copper and if it saves copper, it saves cost. You can use smaller wires and as far as I know there is no disadvantage to it. I think it will be possible to fire high-compression ratios with six volts, but it may be better with 12 volts. It takes a bigger battery, but if you consider copper and if you can get your battery size down, it may come as an economic change.

Q: Would it make winter starts easier?

GRAVES: That depends. If you put a big enough starter and enough copper and battery in a car you can start anything. It gets down to economics. A properly maintained and serviced automobile isn't hard to start in winter.

Q: Europeans use a lot of aluminum in their cars. Are we ready for it here?

GRAVES: It is a matter of cost. And also there is no way of attaching aluminum as easily as steel. Welding is a problem, soldering is a problem. Bracing is, too. Attaching devices is what holds aluminum back. Europeans use it mostly on custom cars where there is considerable hand labor.

Q: In other words, even in the richest country in the world, in building automobiles you have to keep an eye on costs?

GRAVES: That is right. We have to keep costs down so we can sell in volume and that means mass production. That is an important difference between these European sports cars and ours. ★ ★ ★

Experts Fear Jet Airliners May Damage Runways

Serious heat damage to airport runways was cited as one of the biggest potential problems created by jet airliners. Fiery blasts from test engines mounted close to the ground have produced surface temperatures up to 500 degrees Fahrenheit.

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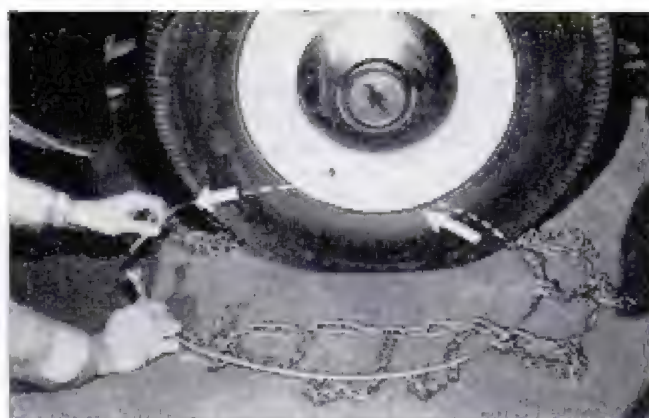
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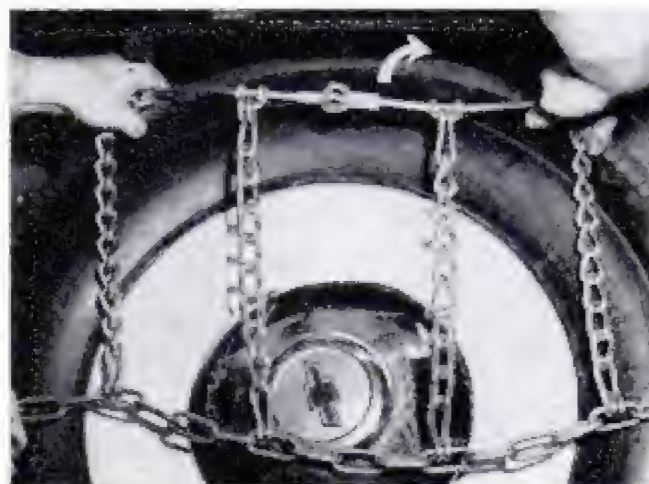
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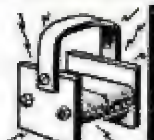
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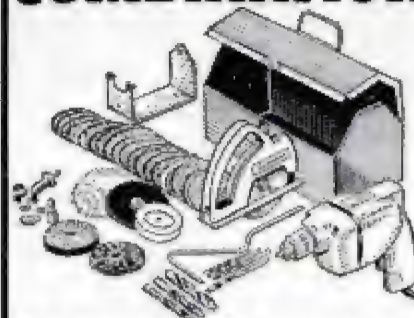
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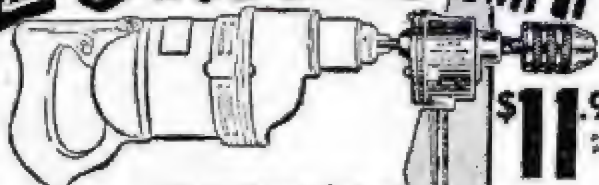
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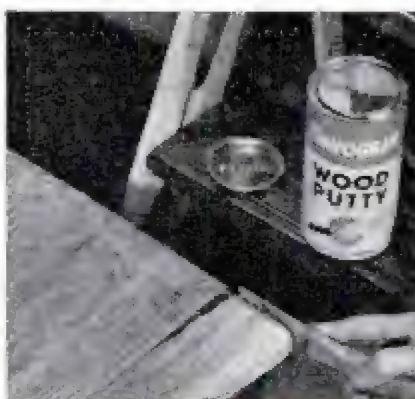
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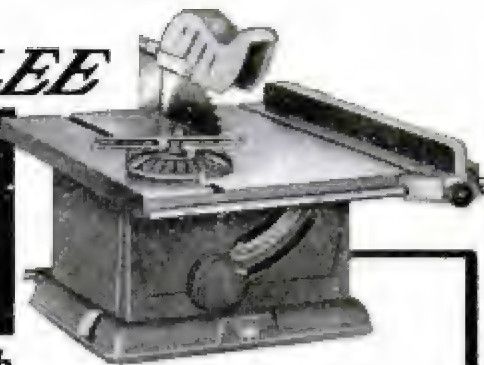
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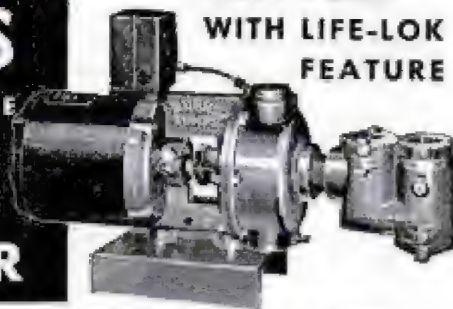
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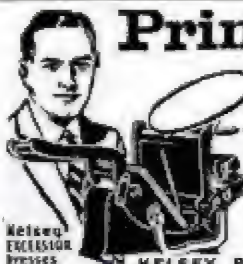
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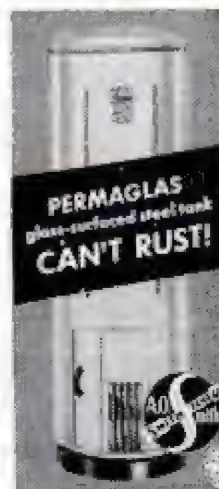
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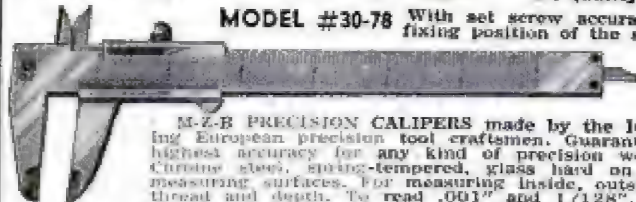
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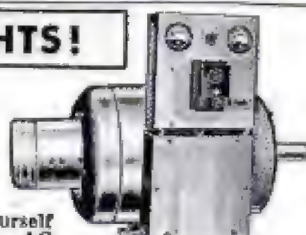
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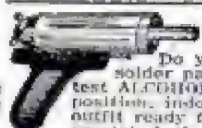
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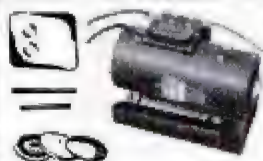
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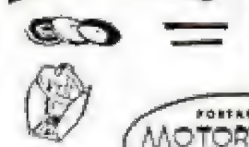
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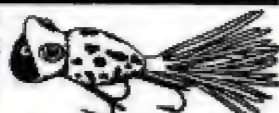
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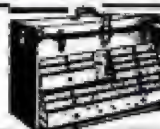
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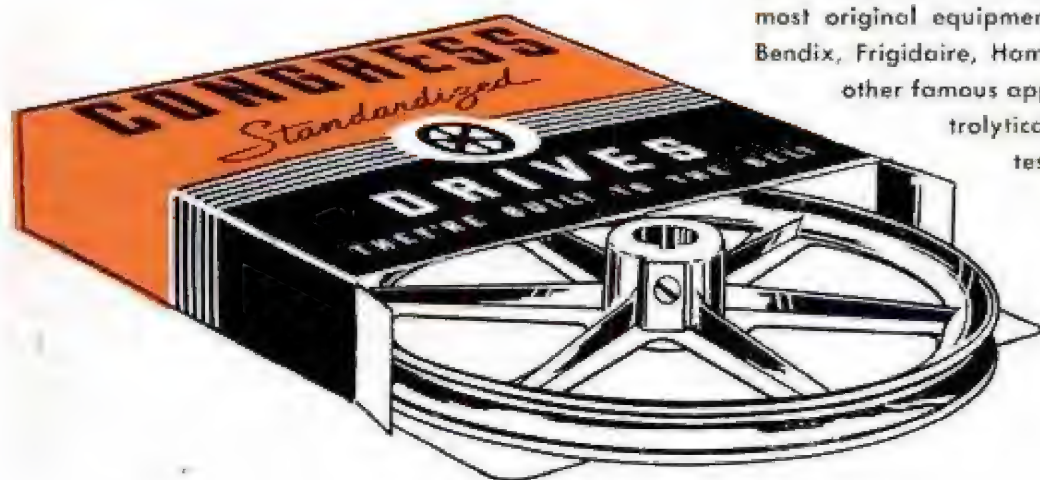
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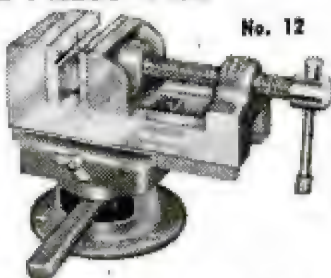
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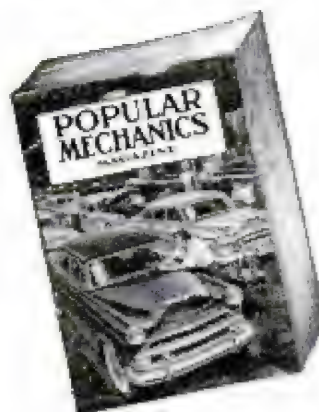
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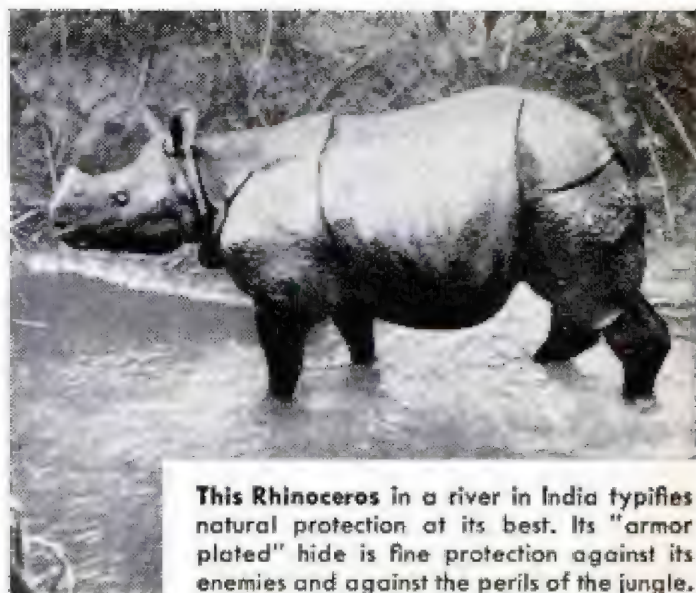


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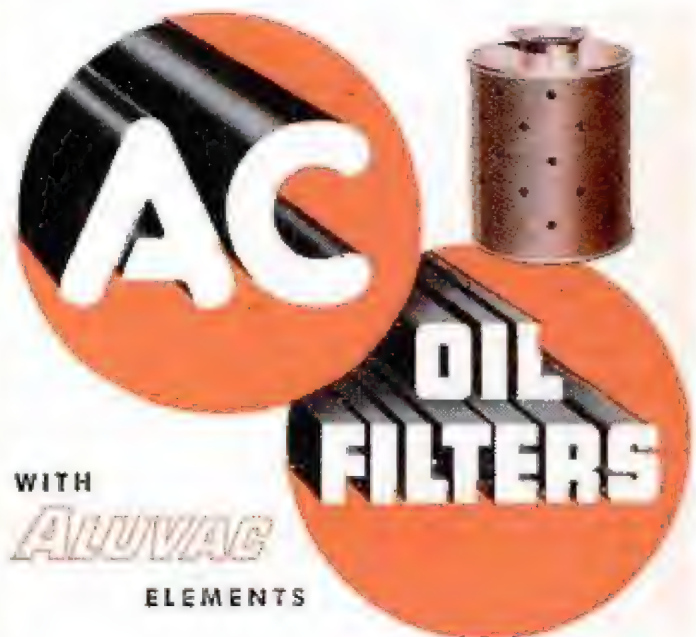
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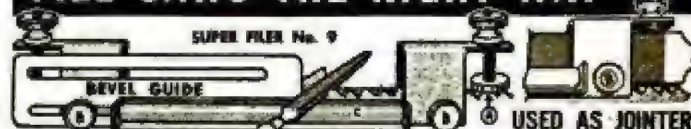


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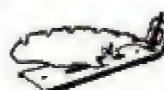
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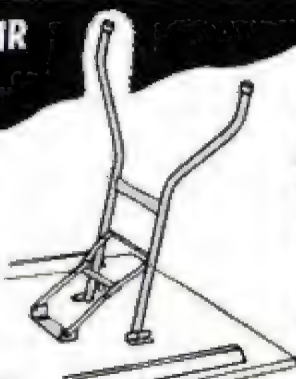
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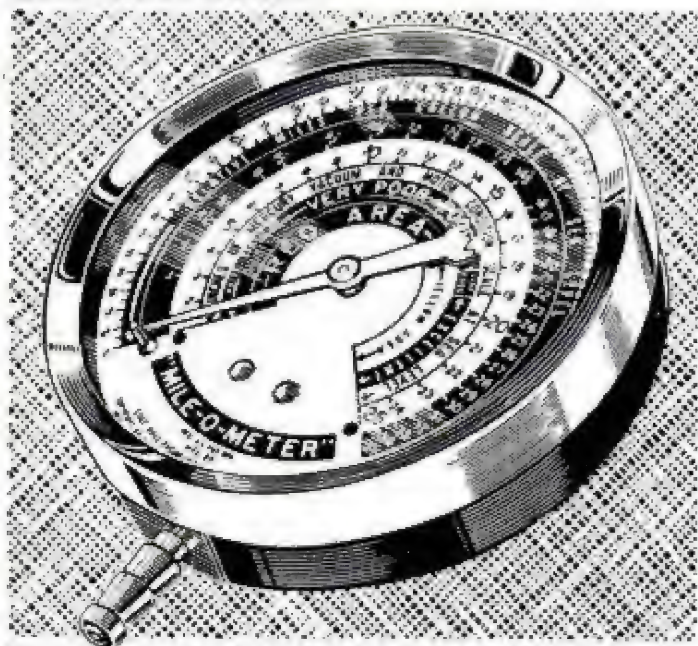
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**Tough on Oil-Pumping
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Raymond Parsons, 90 Tower Avenue, So. Weymouth, Mass., is typical of the thousands of enthusiastic Mile-O-Meter owners.

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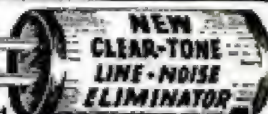
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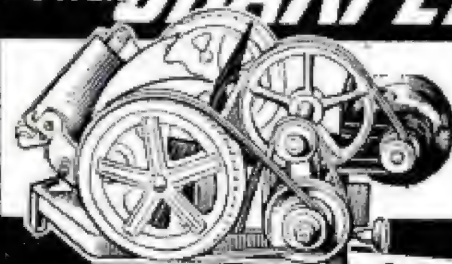
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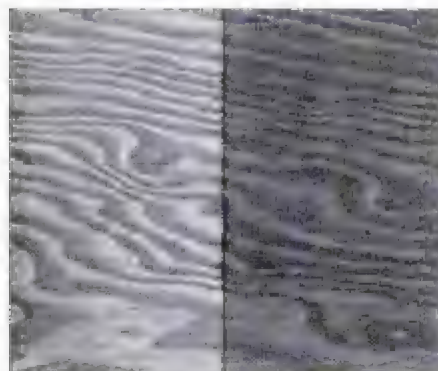
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These "with-and-without" panels of stained Douglas fir plywood show dramatically how a Rez first coat "holds" the delicate beauty and gradation of the original grain. Panel at left was treated with Rez before staining; panel at right received only stain.



the softer surface areas almost as dense as the harder areas. When stain is applied after Rez has "set" for a few hours, penetration is quite uniform, with the result that the shading and contrast of graining are retained. The surface does not get blotchy or streaky as untreated wood often does upon staining . . . A Rez base also makes it easy to get fine "furniture" finishes when varnish is applied.

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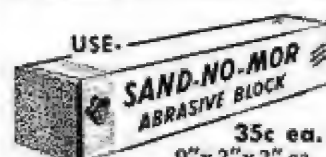
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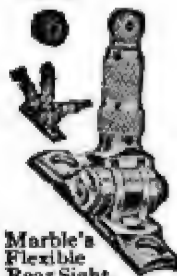
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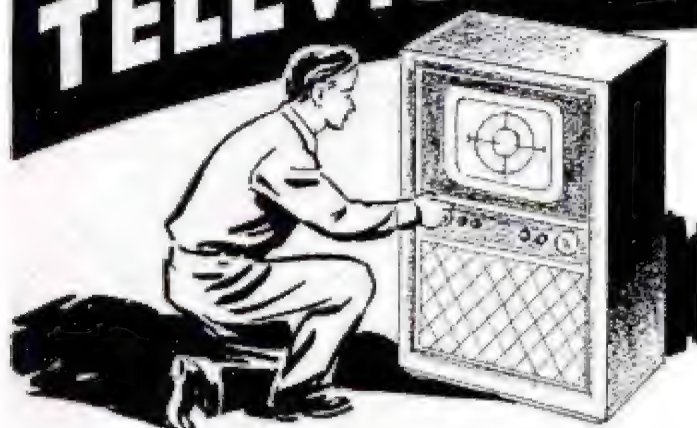
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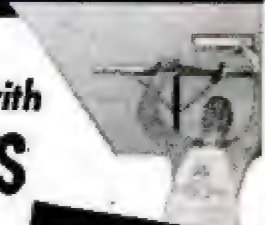
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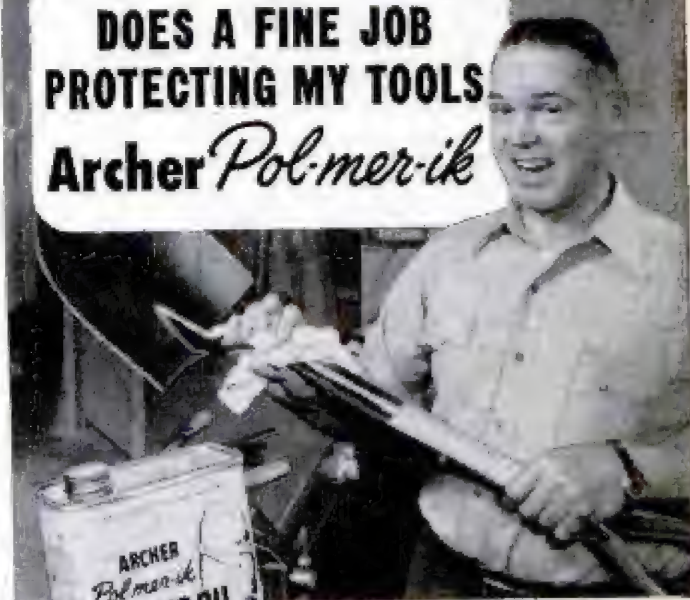
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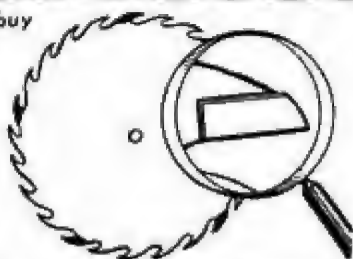
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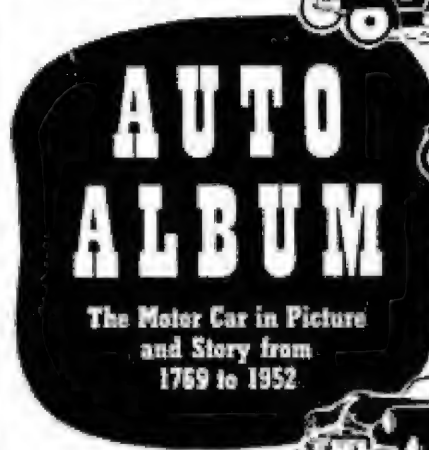
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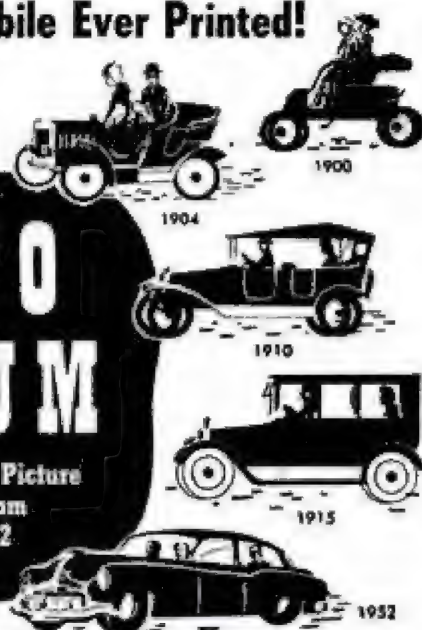
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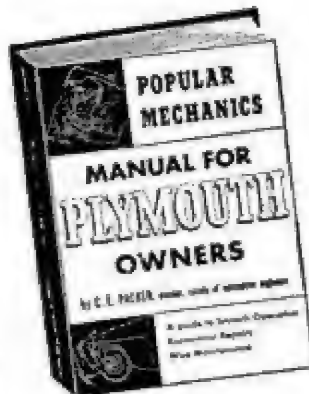
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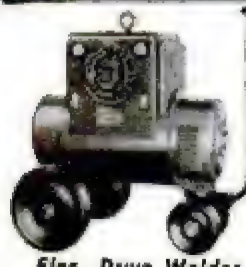
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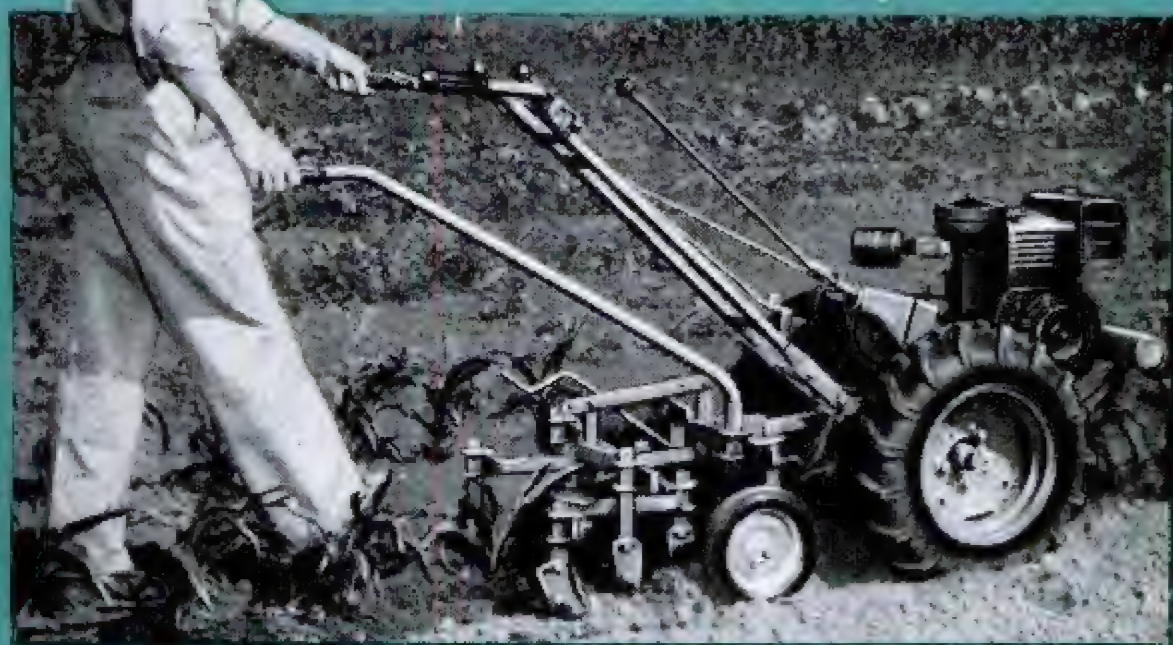
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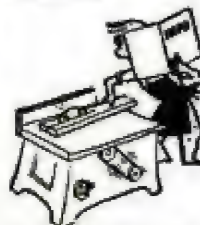
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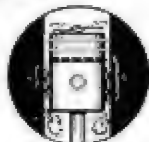
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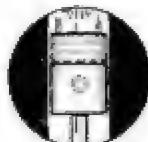
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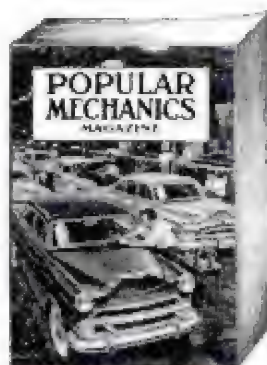
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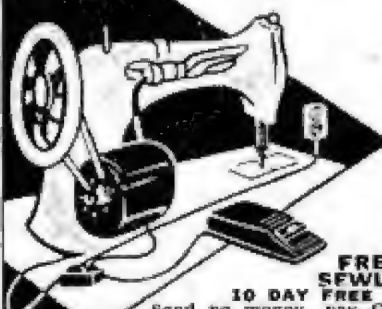
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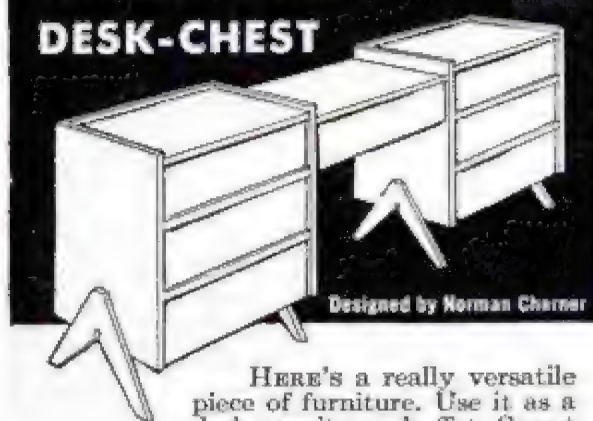
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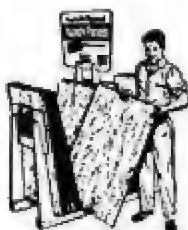


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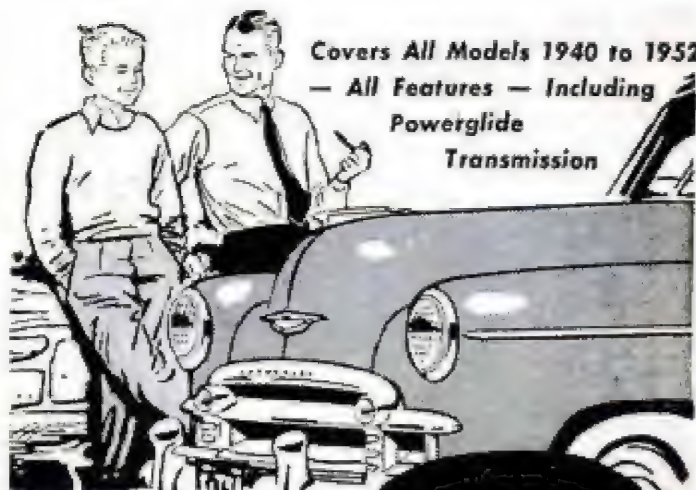


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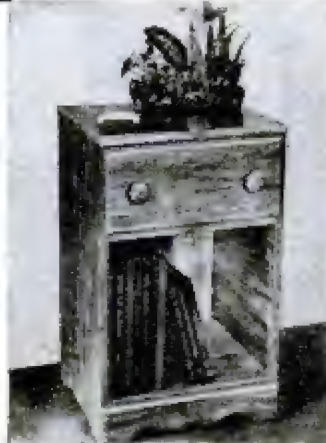
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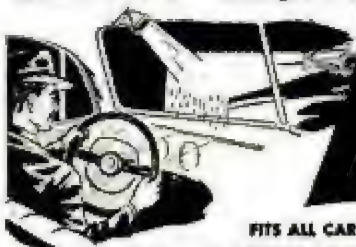


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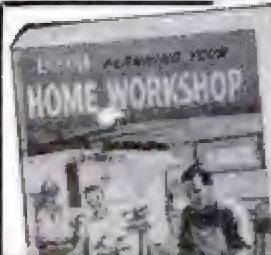
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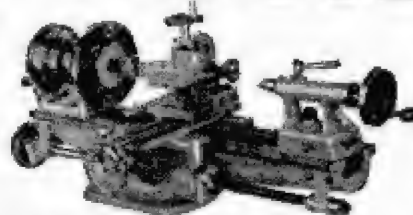
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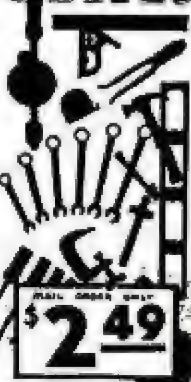
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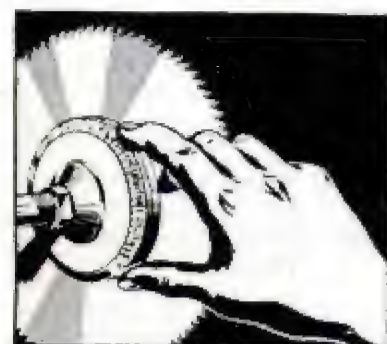
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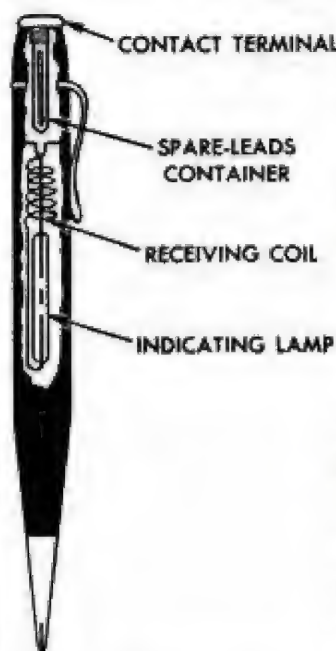
Box 98 North End Station
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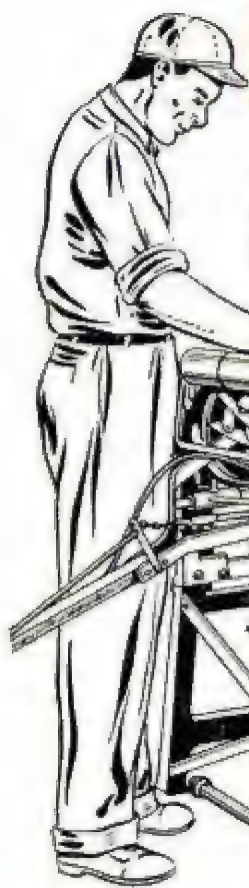
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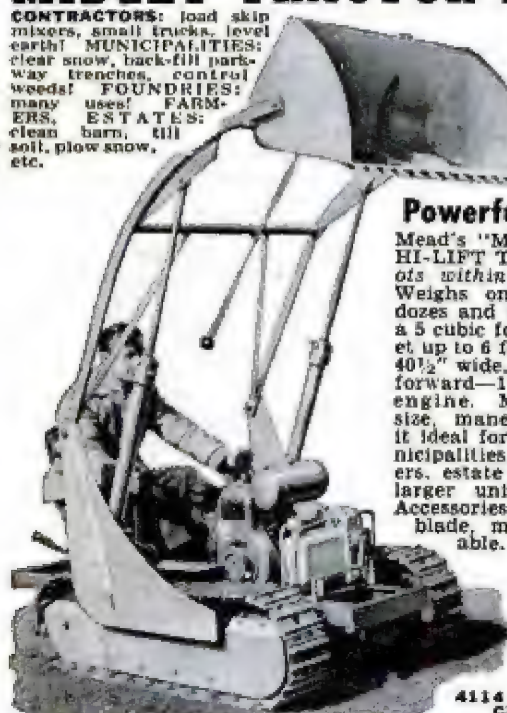
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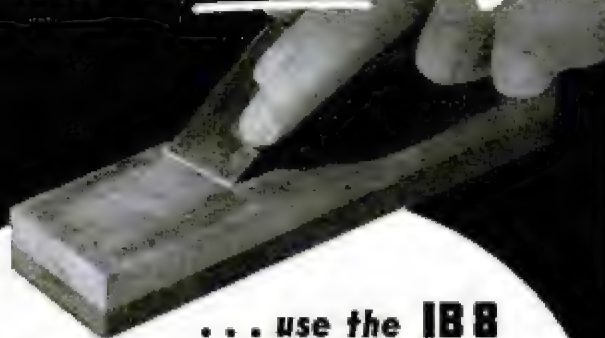
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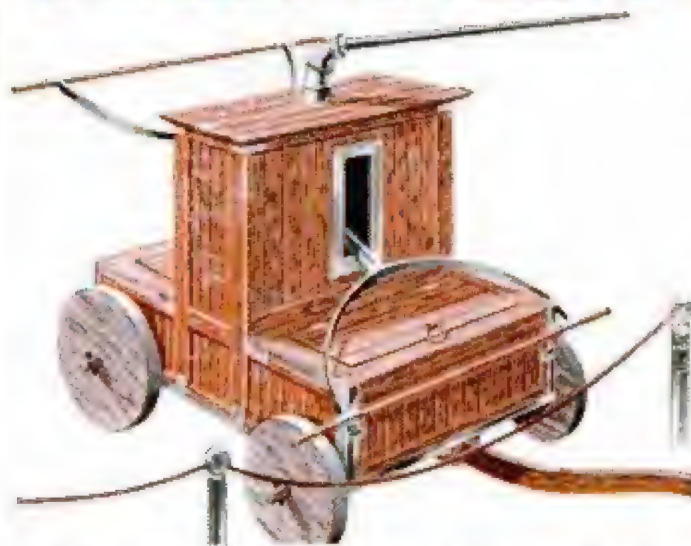
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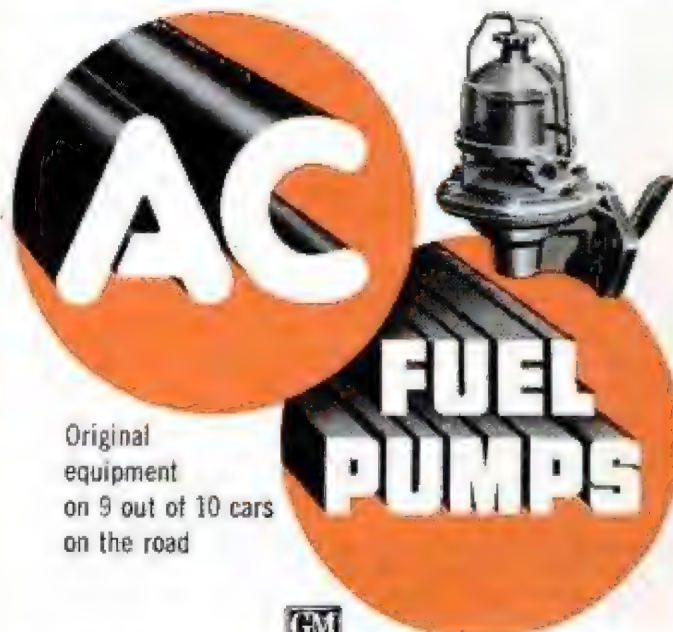
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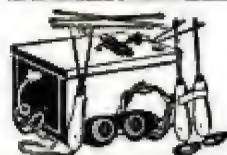
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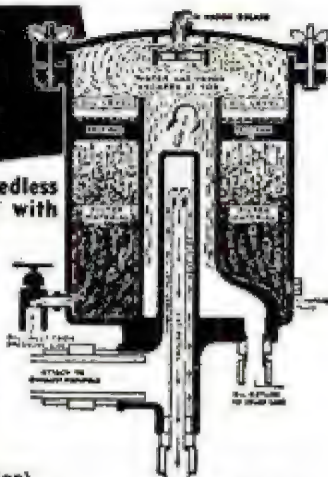
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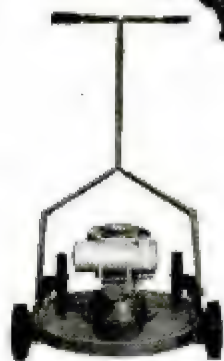
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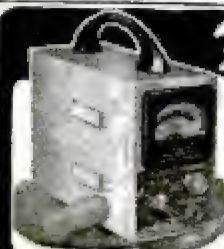
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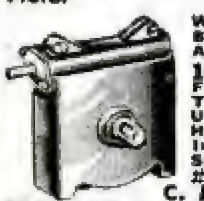
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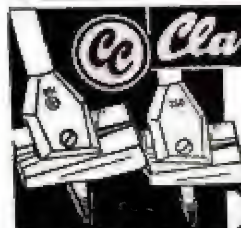
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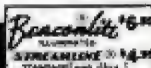
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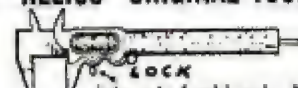
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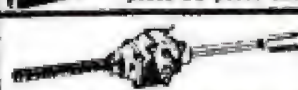
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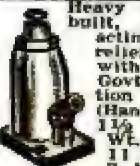
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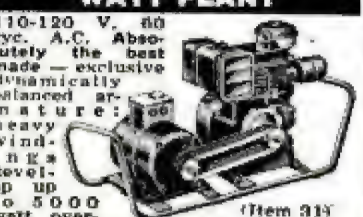
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Arc is easy to
strike and hold, because of specially
designed arc stabilizer. Hi-to switch
and dial control gives wide range of
welding heats. Run welder at 2500
rpm. with tractor, jeep or 15 hp. gas
engine, or 7 hp. elec. motor. Com-
plete with instructions, guar. and
double V belt or flat pulley. You can
pay more, but you can't buy a better
welder. (Item 38) Wt. 110
lbs. \$400 value at... **\$99.75**
DUAL CONTROL MODEL same as
above but with built-in dual rheostat
for low heat soldering, brazing, welding.
Spec. **\$119.50**
WELDING KIT Two 10 ft. leads,
welding helmet, electrode holder,
ground clamp. Sold
only with welder at... **\$10.50**
Write for prices on A.C. Arc Welders.

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New
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Mileage
Up to
150 per
Gallon

\$199.50
\$249.50
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EXTENSION CORD



(Item 16) 40
ft. heavy
duty, made
of specially
insulated
No. 14 2-
conductor
wire. So
tough that
you can drive over it and yet flexible
and easy to handle. Resists oil,
grease or water. Extends elec-
tricity up to 400 ft. without volt-
age drop. Use indoors or out.
Complete with heavy rubber plug
and outlet. Wt. 2 1/2 lbs. Usually
\$4.50—Special 40 ft. **\$1.99**
Comb: 2-40 ft. and 1-20 ft.
(total 100 ft.)... **\$4.95**
100 ft. length (one piece) **\$4.95**
WIRE ONLY (Item 60)
No fittings, 100 ft. **\$4.00**

Heavy Duty Power Cable
#12-2 Cond.—stranded, very
flexible, rubber covered, special
outside conductor for grounding
power tools, etc. Finest heavy
duty power cable made. 50 ft.
(Wt. 8 lbs.) Item 199... **\$6.95**
100 ft. (Wt. 16 lbs.)... **\$12.95**
Item 200... **\$12.95**

32 Pc. SOCKET SET

#12-2 Cond.—stranded, very
flexible, rubber covered, special
outside conductor for grounding
power tools, etc. Finest heavy
duty power cable made. 50 ft.
(Wt. 8 lbs.) Item 199... **\$6.95**
100 ft. (Wt. 16 lbs.)... **\$12.95**
Item 200... **\$12.95**

32 Pc. SOCKET SET

Highest quality guar. non-break-
able sockets made by Husky.
Beautiful, matched chrome al-
loy. Absolutely the best. Com-
plete range of 21 sockets from
3/4" thru 7/16" in 1/4" drive and
7/16" thru 1-1/16" in 1/2"
drive; 2 extensions, reversible
1/2" ratchet, adaptor bit, slide
head, all angle coupling, 2 end
wrenches, 1/2" speeder handle
and sturdy metal tool box. For
prof. mechanics who want the
best. Wt. 14 lbs. Easily worth
\$41.50. While
they last only... **\$16.95**

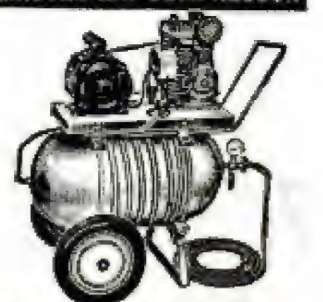
45 Pc. SOCKET SET

(Item 205) Contains a complete
set of sockets in 1/2" drive, 3/4"
drive and 1 1/4" drive, plus all
necessary extensions, handles,
speeders, reversible ratchets,
etc.; all uncond. Guaranteed
against breakage. Beautiful
matched chrome thin wall al-
loy sockets in a sturdy hand-
some steel tool box. Wt. 17 lbs.
List price \$62.90.
Factory Special... **\$26.95**

MASTER AIR COMPRESSOR

(Item 209) High pressure type
for large volume of air for heavy
duty service. For paint spraying,
inflating truck and auto tires,
greasing, and the hundreds of
other jobs done by compressed
air. Piston type, 2" bore com-
pressor with built-in air filter.
Master built with hi-strength al-
loys and precision bearings.
Stainless steel tank, 12"x24",
2100 cu. in. cap. Safe up to
500 lbs. Equipped with automa-
tic switch that starts and stops
motor to maintain desired pres-
sure (up to 150 lbs.) and check
valve, safety valve, gauge, shut-
off valve, 20 ft. air hose and
tire chuck. Beautifully balanced
on ball bearing wheels and rub-
ber tires. Low factory prices.
With 1 1/2 hp. 110 v. A.C. motor
(Reg. \$175.00) **\$98.50**
(Item 209)... **\$98.50**
With 1 1/2 hp. motor
(Reg. \$199.50) **\$119.50**
(Item 209A)... **\$119.50**
With 2 hp. Briggs Gas Engine
(Reg. \$199.50) **\$109.50**
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Write for price of compressor
only. A complete line of spray
guns and air tanks available.

MASTER AIR COMPRESSOR



(Item 209) High pressure type
for large volume of air for heavy
duty service. For paint spraying,
inflating truck and auto tires,
greasing, and the hundreds of
other jobs done by compressed
air. Piston type, 2" bore com-
pressor with built-in air filter.
Master built with hi-strength al-
loys and precision bearings.
Stainless steel tank, 12"x24",
2100 cu. in. cap. Safe up to
500 lbs. Equipped with automa-
tic switch that starts and stops
motor to maintain desired pres-
sure (up to 150 lbs.) and check
valve, safety valve, gauge, shut-
off valve, 20 ft. air hose and
tire chuck. Beautifully balanced
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ber tires. Low factory prices.
With 1 1/2 hp. 110 v. A.C. motor
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With 1 1/2 hp. motor
(Reg. \$199.50) **\$119.50**
(Item 209A)... **\$119.50**
With 2 hp. Briggs Gas Engine
(Reg. \$199.50) **\$109.50**
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MODEL 106

*At last a
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AT A PRICE
EVERY MAN
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\$49.50
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**IDEAL FOR FURNI-
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Leaves no fur — pro-
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NOW — a radically new orbital sander that produces a fine piano finish — even better than hand sanding! And 10 times faster! Abrasive pad travels at high speed in 1/4" orbit. Grits move in overlapping circles in all directions — with, against, across the grain. Therefore, no tendency to dig or burn... can't track. Doesn't gouge. Regardless of direction of grain — or variations in wood density — Porter-Cable 106 makes the surface smooth, even, uniform. Won't ripple.

NEW FROM TOP TO BOTTOM

Powerful AC-DC motor — not a vibrator. 4,000 RPM under load. Gearless drive — assures trouble-free operation. Dust-free air intake. Patented paper clamp pulls 1/2 of standard 9" x 11" sheet smooth and tight. Weighs only 6 pounds.

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**CHAMFERS EDGES;
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112 PIECE ASSORTMENT \$3.95
FOR ELECTRIC GRINDER
\$10.00 VALUE - ONLY

Here's what you get! Mounted Stones on 1/2" mandrel, Drum Sander, Sanding Sander, for sander, Rotary Cutters, Wire Scratch Brush, Bristle Brushes, Circular Saw, Buffing Wheel, Grinding Wheel, Rubber Polishing Wheel, Cut-off Wheels, Rubber Grinders, Mandrels to fit above tools, and 2



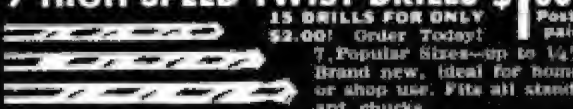
Assorted glass cutter on 1/2" or 3/32" shank. Will fit all hand grinders. Ideal for cutting wood, metal, or plastic. Brand new.

12 MINIATURE CUTTERS \$1.00



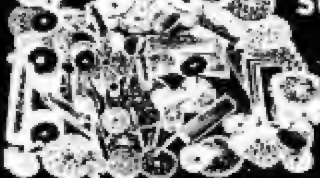
FOR CUTTING WOOD, PLASTIC, or METAL. Actual size. Assorted shapes on 3/32" shank. For die makers, home workshop, etc.

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15 DRILLS FOR ONLY \$2.00! Order Today! 7 Popular Sizes—up to 1/4" Brand new, ideal for home or shop use. Fits all standard chucks.

5 DRILLS FROM 1/8" to 1/2" DIAMETER—\$1.95

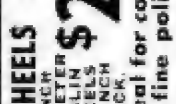


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FOR ELECTRIC GRINDERS

Grinding Wheels, Cut-off Wheels, Sanding Discs, Mounted Stones, Sharpening and Honing Stones, Rotary Cutting Burs, Abrasive Cartridges, Mandrels, and many other items.

5 for \$2.00



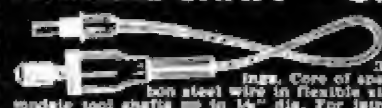
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Overloading impossible with new "Slip Clutch" power shaft. Overload stops rotation automatically, with warning "click". No damage or wear on cable. Sturdy ball bearing handpiece. Motor and takes 1/2" shaft. Adapter for 3/8" or 3/4" shaft, \$1.50.

1953 Illustrated Catalog 10c

FLEXIBLE SHAFT — ONLY \$4.95



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With 12 Bands in Assorted Grits. 1/2" dia. x 1" long on 1/4" arbor with 12 bands.
ONE DRUM, 1 1/2" DIA. x 1" LONG ON 1/4" ARBOR WITH 6 EXTRA SLEEVES \$1.00



12 MOUNTED WHEELS \$2.95
For grinding on plastic, wood, soft and hard metal. Regular \$8.50. All 12 wheels on 1/4" Mandrel. \$3.80.



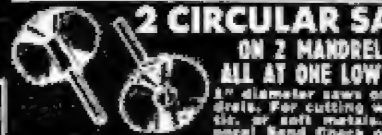
18 GRINDING WHEELS \$1.00
and rubber polishing wheels, up to 1/2" dia. For grinding & polishing metal, plastic, wood, etc. on 3/32" mandrel.
20 CUT-OFF WHEELS 1 1/2" DIA. WITH 1/4" MANDREL \$1.00



20 ABRASIVE ROLLS, cloth, and 1/4" mandrel \$1.00
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With 3 interchangeable collets, opening from 3/32" to 1/2" on 3/4" mandrel. Price each only



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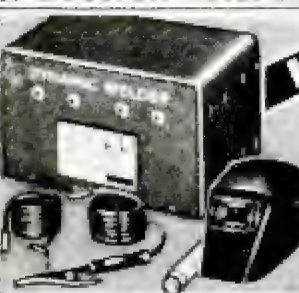
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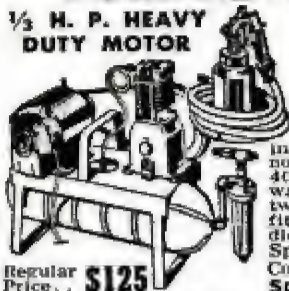
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Special Price
Complete Outfit..... **\$67.50**
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Heavy Duty Windings

110 v., 80 cy., A.C., takes starting overload up to 5000 watts. Floating Base for Automatic Belt Adjusting, Bolts, etc. 5 H.P. Wisconsin or Briggs & Stratton Model 14 Engine. Voltmeter, 2 plug-in receptacles. Portable Tubular Steel Skid Type Carrier. Dim.: L 34 3/4" x W 17" x H 20". Wt. 180 lbs. List \$375. **\$299.50**

Generator only, with voltmeter, 2 plug-in receptacles. Ship. Wt. 75 lbs. **\$169.50**

500 WATT GENERATOR, Wt. 35 lbs., **\$99.50**
5000 to 6000 W. GENERATOR, 110/220V. Wt. 225 lbs., **\$325**
3 K.W. Signal Corps Light Plant, List price \$2200. **\$595**
2 1/2 K.W. Leland Compressor, Reg. price \$425, Wt. 135 lbs. **\$195**



"Wellworth" BLOWER BARGAIN



Quiet operating. Double wheel inlet, double width blower. For heating, ventilating, cooling, air washing, exhausting and forced draft. DIMENSIONS: 10" wheel; outlet 13 1/4" x 11 3/4"; inlet 8 3/4". Height 19". Width 18". Depth 16 1/2". C.F.M. 1 1/4 S.P. 1600; outlet vel. 1575. Wt. 45 lbs. **\$27.50**

1575. Wt. 45 lbs. **\$27.50**

With belt and variable speed pulleys, \$2.50 extra. Same blower, complete, with 1/4 H.P. Motor **\$45.00**



RED SEAL CONTINENTAL GAS ENGINE

Red Seal. 2 HP with 6 to 1 reduction gear. Operates at 450 R.P.M. For lawn mowers, scooters, garden tractors, pumps, compressors, generators, etc. List Price **\$79.50**. Shipping wt. 54 lbs. **\$47.50**

SPECIAL PRICE. **\$47.50**

Same engine, 3600 r.p.m., **\$47.50**

Wellworth V-BELT CLUTCH



Takes starting load off engine or motor. "A" belt. 2-35 pitch diameter, 3/4" bore, ball bearing. Positive action. Price **\$7.50**. 3/4" bore, **\$8.50**. Bushing for 1/2" shaft, 15c.

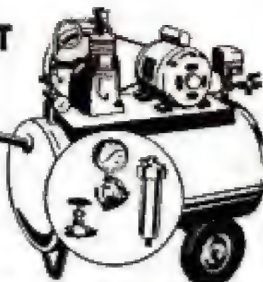
MERCURY CLUTCH



3" A-belt pulley. Centrifugal action for heavy loads. 5/8" bore. 3 1/2 x 2 1/2. List. **\$9.95**

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AUTOMATIC COMPRESSOR UNIT WITH 22 GALLON TANK



1/2 H.P. heavy duty capacitor motor. 110 volt A.C., compressor 2" bore, 1 1/4" stroke, 60 cycle, 2x1 1/4 inch piston type, splash feed lubrication, 14"x32" tank, automatic pressure switch, CFM 2.8 at 100 lb. pressure. Check valve, safety valve, 20 ft. air hose with air chuck for inflating tires. V. belt drive. Ball bearing wheels, with 2"x8" rubber tires. Portable with handle. Ship. wt. 150 lbs.

With 1/2 h.p. motor
Reg. price \$175
\$98.50

With 1 1/2 h.p. gas engine
Reg. price \$200
\$124.50

Regulator, gauge and filter included at no extra cost.

Larger size compressor units furnished with same tank and accessories described above:

with 2 1/2 x 2 Compressor, 1/2 h.p. motor, 3.24 c.f.m., wt. 175 lbs. **\$136.50**
with 2 1/2 x 2 Duplex compressor, 1 h.p. motor, 7.35 c.f.m., wt. 200 lbs. **\$225.00**

WELLWORTH AIR COMPRESSORS

Aluminum piston, stainless steel valves, 3 piston rings, bronze bearings, splash lubrication. Intake muffler. V-belt, cast iron fan cooling flywheel.

Model W800 COMPRESSOR 2"x1 1/4", 2.8 c.f.m. Operates with 1/4 HP or 1/2 HP motor up to 150 lbs. **\$20.50**

Weight 20 lbs. Special price.....

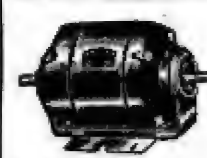


MODEL 200 COMPRESSOR
2 1/2" x 2", 2.55 to 4.80 c.f.m., up to 150 lb. pressure. Operates with 1/2-3/4 HP motor. **\$27.95**

Special Price.....
Shipping wt. 24 lbs.

MODEL W7 COMPRESSOR
2 cylinder 2 1/4"x2", 5.10 to 8.50 c.f.m., up to 150 lb. pressure. Operates with 3/4-1 1/2 HP motor. **\$54.50**

Special Price.....
Shipping wt. 45 lbs.



1/2 H.P. MOTOR

DELCO 1/2 H.P. 2" shaft, 1750 R.P.M. 115V. A.C. Split phase, rubber mounted, high torque starting, overload capacity. Makes a dandy low cost grinder. Wt. 28 lbs. **\$15.95**



1/12 H.P. MOTOR

Delco 110 V. 60- Cy. A.C. 1 phase 1750 r.p.m. 2 amps., will take 50% overload. Shaft 3/8"x1 1/4". Heavy duty, bronze sleeve bearing. Size 6" long, 5" high, net wt. 12 lbs. List \$21.00. **\$13.50**

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Right Angles, 110V. AC
1/30 h.p. 6 RPM **\$11.95**
1/20 h.p. 135 RPM **\$9.50**
1/30 h.p. 1250 RPM **10.25**



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WALKING
TRACTORS
LOW AS
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MODERN LAWN MOWER SHARPENER

Service departments of leading Lawn Mower manufacturers use the Modern Lawn Mower Sharpener. One lever moves lawn mower into grinding position. Gasoline and oil remain in engine while sharpening, no dismantling of wheels, roller or handle. The Modern is a precision bed knife grinder—no extra grinder to buy. Imitated but never equaled—Compare before you buy. If it isn't a Modern it can't be Modern (Prices subject to change without notice)



\$263.00
with motor
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28 Lawn Ornament Patterns, 25c. Other Patterns: 15-20" high; Dutch Girl, Dutch Boy, Pirate, Bull Terrier, Mexican Girl, Mexican Boy, Dwarf, Penguin, Flower Girl, 15c each. 25 Novelty Patterns, 30c. All 62 Full Size Patterns, \$1.00.

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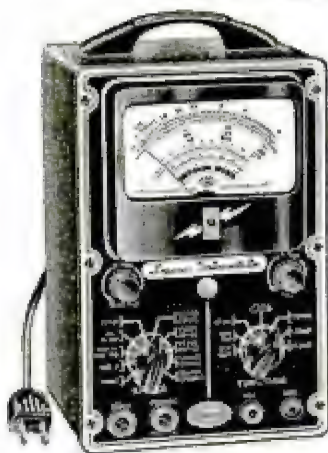
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Superior's New Model 670-A

SUPER-METER

A COMBINATION VOLT-OHM MILLIAMMETER PLUS CAPACITY REACTANCE INDUCTANCE AND DECIBEL MEASUREMENTS



The Model 670-A comes housed in a rugged, crackle-finished steel cabinet complete with test leads and operating instructions. Size 6 1/4" x 9 1/2" x 4 1/2".

ADDED FEATURE: The Model 670-A includes a special GOOD-BAD scale for checking the quality of electrolytic condensers at a test potential of 150 volts.

SPECIFICATIONS:

D.C. VOLTS: 0 to 7.5/15/75/150/750/1,500/7,500 Volts.
A.C. VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts.
OUTPUT VOLTS: 0 to 15/30/150/300/1,500/3,000 Volts.
D.C. CURRENT: 0 to 1.5/15/150 Ma. 0 to 1.5/15 Amperes.
RESISTANCE: 0 to 1,000/100,000 Ohms. 0 to 10 Megohms.
CAPACITY: .001 to 1 Mfd. 1 to 50 Mfd. (Quality test for electrolytics).
REACTANCE: 50 to 2,500 Ohms. 2,500 Ohms to 2.5 Megohms.
INDUCTANCE: 15 to 7 Henries 7 to 7,000 Henries.
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\$28.40 NET

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 Dept. B-46, 38 Murray Street, New York 7, N. Y.

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One of the handiest lights, you can own! Clamps on anywhere. Fully adjustable ball swivel lets light move freely. Can be used with ordinary bulb, photoflash or photo flood. Also use as reading lamp, work lamp, etc. Socket assembly includes clamp, adjustable swivel, cord and plug. **LAMP ALONE 139**

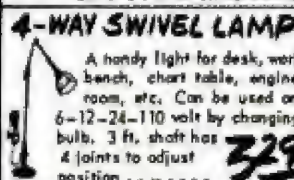
Spot reflector (5" diameter) } **109**
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12 Volt light - 4" lens. **429** 24 Volt light - 5" lens. **479**
 Set of 3 Filters (Red, Green, Amber) Specify Lamp Size 99c per set.



4-WAY SWIVEL LAMP

A handy light for desk, work bench, chart table, engine room, etc. Can be used on 6-12-24-110 volt by changing bulb. 3 ft. shaft has 4 joints to adjust position. **329**



FLEXIBLE GOOSE NECK LAMP

A real Surplus Buy! For the Home or Workshop. 110V, AC. Has flexible shaft, long wire, socket, switch, and mounting bracket. **125**



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WAR SURPLUS MIX. Four hand tools plus an Army Cinder Scoop for your fireplace. The tools alone are worth far more than our price but we throw in the Cinder Scoop FREE! Tools include a Hammer Punch, Chisel-Hammer, Stake Driver and 17" Stanley Screwdriver. All have crucible cast steel heads & hardwood handles. For heavy work around home, machine shop, garage, ranch, farm, etc. **289**

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An all-purpose kit! 6 useful tools - a fine steel trimming knife - pair of genuine WISS heavy duty scissors - a steel roller for cementing seams in fabric, wallpaper, etc. Two 12" half round files - a wire burnishing brush. Complete in cloth case. Ideal for wallpaper and linoleum. A 9.50 VALUE **329**

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Rust resistant, alloyed steel. Extra flexible. Pre-formed, 7 x 19 strand. On reels
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 5/64" - 5a ft. (6x7) 1/4" - 129a ft.
 3/32" - 59a ft. (7x7) 9/32" - 15a ft.
 1/8" - 7a ft. (2x19) 5/16" - 16a ft.
 5/32" - 7a ft. " 3/8" - 18a ft.
 3/16" - 10a ft. " 1/2" - 20a ft.

Stainless Steel Cable - Pre-Formed
 1/16" - 7a ft. 5/32" - 20a ft.
 1/8" - 18a ft. 3/16" - 23a ft.

Bronze Cable - Not Pre-Formed
 1/16" - 5a ft. 5/16" - 23a ft.
 1/4" - 17a ft. 1/2" - 38a ft.

CABLE ASSEMBLIES

Originally made for aircraft controls. Equipped with integral fittings at both ends. Rust-proof. 7 x 19 strand.

1/16" x 28 ft. with turnbuckle ends
 Two lengths for Only **159**

3/16" x 8 ft. with threaded stud at one end & eyelet on other. 3 lgths. **159**

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3/32" x 49 ft. Made of 2 lgths. of 17 ft. with turnbuckle ends, and 2 lgths. of 3 ft. with 1 turnbuckle and 1 clevis end. One complete length Only **198**

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Room to carry ammo, flashlight, compass, camera, maps, food, first aid kit, etc. Made of Heavy O.D. canvas. Has a wide, adjustable shoulder strap. Two rings on each side for tying on extra equipment. Inside has two large compartments. Cover straps down. Size: 12" x 21" x 4". **149**

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Was standard navigation equipment on Army Aircraft. Has rotating verge range ring, calibrated in 10 increments from 0 to 360°. Two parallel grid wires for N-S alignment. Rubber lined. Ideal for airplanes, boats, etc. Cost Gov't approx. \$250. **1750**

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5/8" diameter. 16 strand. Easy to handle. Extra strong. Long lasting. A bargain at **21c PER FT.**

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 TEN - 15 ft lengths. **295**

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Ideal for "ham" operators, experimenting, etc. Mix contains: Headset, mike, button, trans. wire, insulators, switches, condensers, rheostats, terminals, jump cable, etc. 8 packed lbs. **249**

RADIO HEADSET

HS-300 - Two magnetic type receivers in waterproof brass case. Soft rubber inserts in each receiver to fit in to wearers' ear. Pliable steel head band. Ideal for communications, divers, workers in noisy compartments, etc. . . . **NEW 329**

MICROPHONE

Popular telephone type, highly sensitive. Has excellent, clear tone. This was the Signal Corps favorite. An ideal instrument for the Radio "ham" and professional recording studio, for broadcasting, home recording, public address systems, etc. Comes complete with cord & plug. **329**

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For tuning beam antenna, opening and closing doors, etc. Powered by 1/8 HP, 24V, GE motor, engaged to a gear reduction only when electrical contact is made. Operates in either direction. Ideal for an auxiliary power take-off. Has 150 RPM at take-off. **NEW 375 USED 675**

32 POSITION SWITCH

Was used as a bomb selector switch. Has 32 separate contact points through 1 common lead. Ideal for use in radio, experimental work, electronics, shops, factories, etc. Has 32 post, Amphenol connector plug. Uses 12-24 volts current. In all metal case. **395**

AGASTAT TIME DELAY RELAY

A 24 volt solenoid is held from a fraction of a sec. to 15 seconds by a Time Delay mechanism. When coil is energized it operates a double pole, single throw relay switch. Can be used on electric locks, animated signs, labs, etc. Fully adjustable by set screw. **225**

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G-1 Type - Stainless Steel, shatterproof & rustless. Has reinforcing ribs and is pressure tested up to 400 PSI. Has high safety factor. Both ends have 1/4" pipe ports. **1095**

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G-1 - 12 1/2" x 24" ONLY **1095**
D-2 Tank - 500 cu. in. cap. **395**
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Tested to capacities of 3000 PSI. Ideal spraying, welding, inflating, etc. For use with AIR or GAS.
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No. 3 - Double Action Cylinder. Bore is 1", Shaft 1/2", Stroke adjusts from 2-1/2" to 4" with internal sleeve stops. Length overall 8-1/2". Will take 1500 lbs. continuous - 3000 lbs. intermittent. Will lift or push 1100 lbs. . . **575**

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Bore is 3-1/4", Shaft 1-1/8", Stroke 9-1/8". Length 17-1/2". Lift capacity with 1500 PSI line pressure approx. 12441 lbs. **1875**

No. 4 - Double Action Cylinder. Bore 3",

Shaft 1-1/8", Stroke 3-1/2", Length 8 1/2". Lift capacity with 1500 PSI line pressure 10500 lbs. **1875**

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2-3/8", shaft 1 1/2", stroke 15 1/2", length 26". Gives 6645 lbs. lift with 1500 lbs. line pressure. . . **2050**

No. 29 - Double Action Cylinder Special

Gives 20,000 lbs. lift with 1500 PSI line pressure, or will give 40,000 lbs. thrust on intermittent 3000 lb. line pressure. Has 4" bore, 1-1/2" dia. piston shaft. 18" stroke, 30-1/2" length. Ideal for presses, road, farm and shop equipment. Cost Gov't \$390. **2995**

BENDIX HYDRAULIC PUMP AND MOTOR 1395

Has 3 1/2 GPM capacity of 600 PSI. Motor is 1 1/2 HP, 24V, DC. Operates on either 12 or 32V, DC current. Has built-in relief valve adjustable to 1500 PSI. This unit ideal for bait tanks, hyd. lifts, portable loaders, etc. Cost Gov't approximately \$350.00.

VICKERS HYDRAULIC TRANSMISSION

Self contained, 2 H.P., constant torque at all speeds with variable volume reversible, piston pump (controlled by outside lever) supplying piston hydraulic motor. Automatic pressure; dash pot for smooth control. Power output RPM - 0 to 1/3 input RPM in both directions. Input RPM 1800 continuous. 4000 intermittent. Dash pot can be removed for greater RPM. Ideal for lathes, duplicator set-up of mills, conveyors, small cars, drives, gearings, etc. . . **4000**
4" SPLINE SHAFTS for **250 PR**
PULLEY ADAPTERS . . . \$20.00 set

P-1A Pasco Gear Type Pump

Capacity, 1 1/2 GPM at 1500 RPM at 1500 PSI. Pressure limit is 1500 PSI continuous, with intermittent maximum of 1875 PSI for 15 seconds. Normal operating speed is 3750 RPM with an intermittent maximum speed of 4500 RPM. Rotates right-hand only. **Now 895**

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Poppet type. Pressure balanced. Positive shut-off at neutral position. Has dual control handles. An ideal valve for use with single or double acting hydraulic cylinders or in a multi-service system. Can be used in combination with other valves to produce accurate, selective control system. Ports are 3/8" AC tube size (9/16"-20 thread). **675**

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Can Piston type. Permits free flow in one direction while checking any "back flow" until control handle has been positioned to allow free flow in both directions. Has 1/4", tube size ports (7/16"-20 thread). **225**

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Complete hydraulic pumping unit. All necessary parts assembled & ready to work at a great saving in time and cost to you. Delivers 3-1/2 GPM at 1500 PSI. (other volumes and pressures can be obtained by simple adaptations) Unit consists of a gear pump driven by a 2 1/2 HP, DC motor (4000 rpm max.), relief valve, pressure unloading switch, filter, accumulator, reservoir with sight gauge & complete plumbing. Mounted on 19" x 25" aluminum panel. Complete with 24V-DC motor. (Other motors of any current can be adapted) **4995**

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Here's a unit PACKED WITH BRUTE FORCE! Does all those hard, heavy jobs that ordinary Power Tools cannot handle. Easily made from a vacuum cleaner type motor, a gear reduction drive and a few homemade parts. Can be used for turning large nuts & bolts, digging post holes, drilling large holes in wood or metal, driving power tools, & machinery, lifting, pulling, pushing, or any job where a slow speed with high take-off is required. YOU CAN'T STALL IT! Lightweight, easy to handle. Has 1000's of uses in the home, garage, shop, factory. We supply complete instructions.



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Has 18-3/4" stroke at 1 to 1 ratio. 7/8" input and take-off shafts may be shortened if desired. Input shaft has universal joint. Has a threaded mount stud with tapered roller bearing adaptable to swivel mount. **795**

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Converts a high speed, low power input into low speed, high power take-off. Has 2 take-off shafts at 4 to 1 and 16 to 1 ratios. Gear box has a worm drive, bronze gears and a throw-out clutch. Will operate in either forward or reverse directions. Adaptable to many uses on power machinery. . . **1995**

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Has 1 1/2 to 1 gear reduction through bevel gears. Pre-lubricated bearings in dust proof housing. - A Positive lever control clutch. Size: 7" x 6". - 3/4" take-off shaft. **395**

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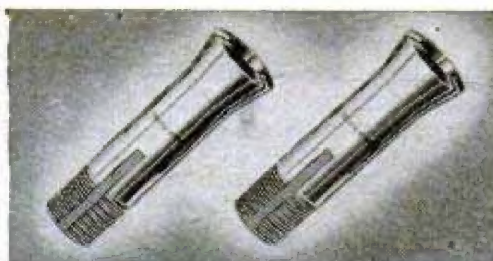
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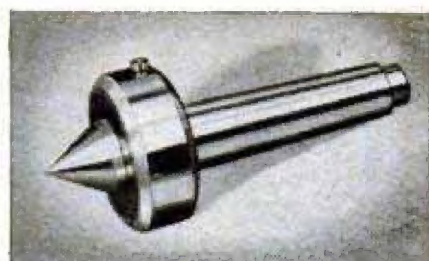
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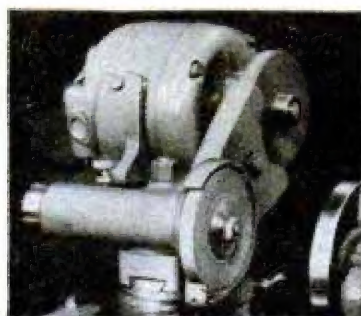
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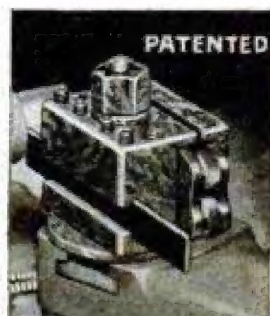
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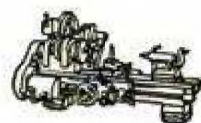
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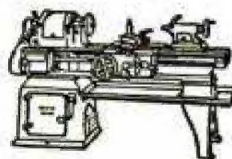


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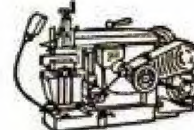
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CHAMPION

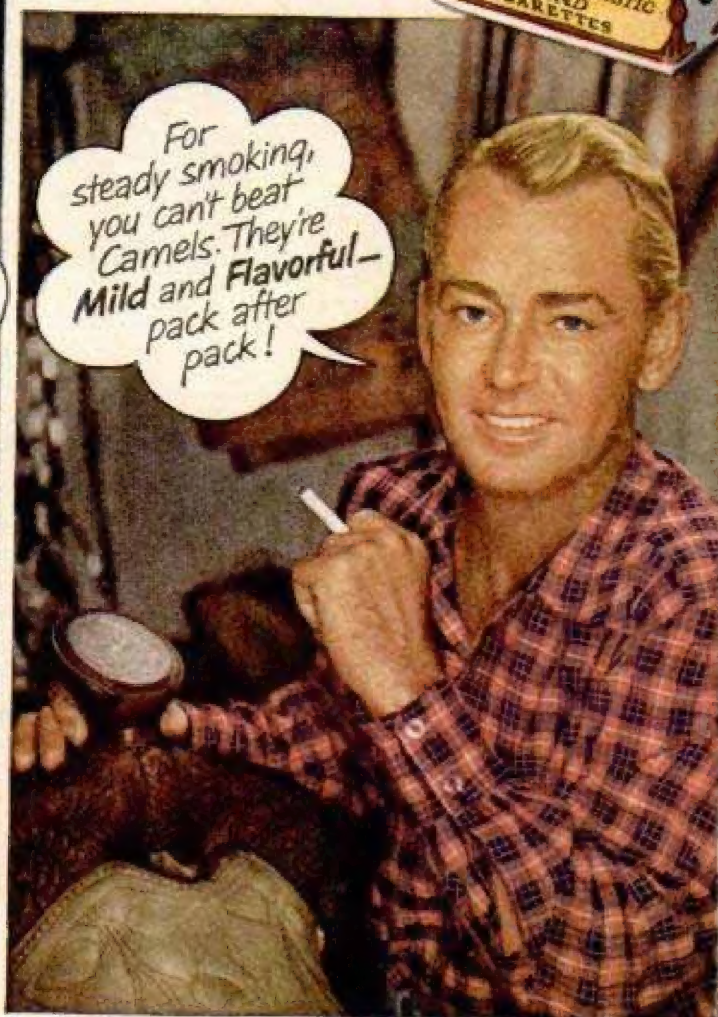
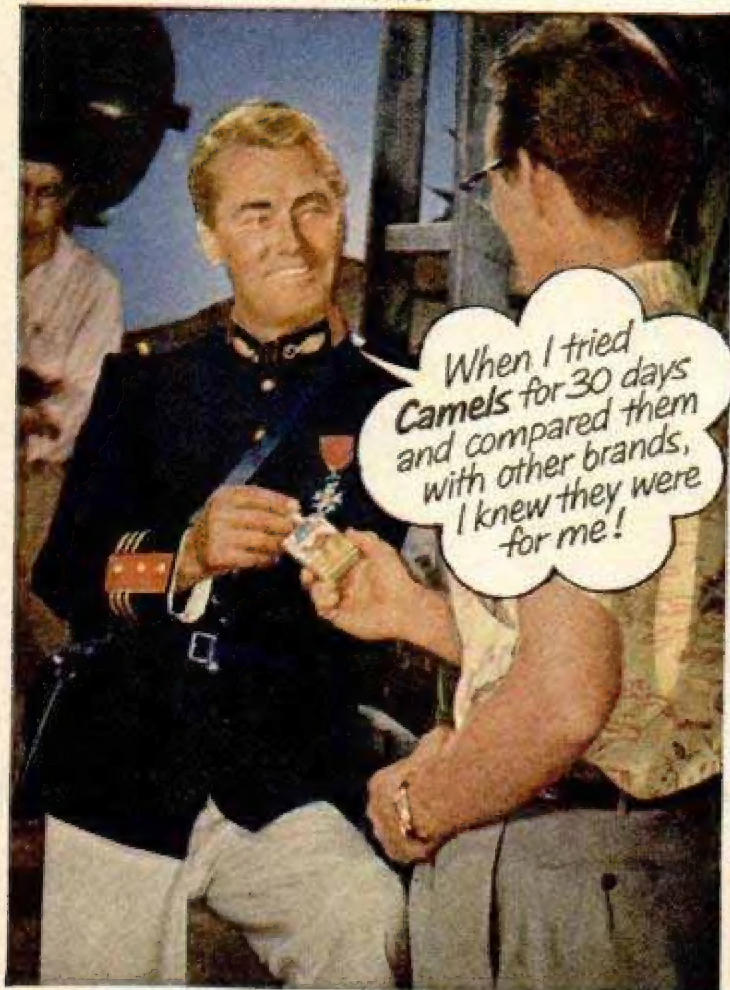
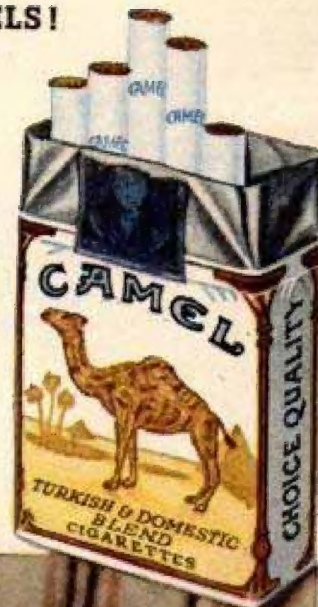
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